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CELL: 9000611217

PRINCETON COLLEGE OF PHARMACY

(Affiliated to JNTUH & Approved by AICTE, PCI, New Delhi)
Chowdaryguda, Korremula (V), Ghatkesar (M), Medchal (Dist.)-500 088

1.1.1 The Institution ensures effective curriculum planning and delivery through a well-planned and documented process including academic calendar and of continuous internal assessment

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Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
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Curricular Planning and Implementation

The Institution ensures effective curriculum delivery through a well planned and documented process.

Response:

Affiliated to JNTU Hyedarabad, Telangana the institution follows the academic regulations , programme structure and syllabus as prescribed by the University. Annual calendar and certification are done as per JNTU norms, while the programme content and evaluation procedure are authorized by the regulatory body – Pharmacy Council of India. The institution offers progrmmes in B.Pharm, and M.Pharm in two specializations. To facilitate more efficiently in services, the institution runs under the departments enlisted; Pharmaceutics, Pharmacology, Pharmaceutical chemistry & Phytochemistry, Pharmaceutical Analysis, Pharmacy Practice and Science& Humanities. Currriculum is divided semester wise for B Pharmacy and M Pharmacy programmes. For the effective implementation, the following steps are adopted by the institution:

Pre-Planning:

1. Class wise time table is prepared by the institution as per the academic calendar released by JNTU Hyderabad allocating the required number of classes to the faculty course-wise.

2. Lesson plans, teaching plans, number of teaching periods are prepared course-wise.

3. List of reference books are prepared at the beginning of the academic year.

4. Syllabus copies and Question banks of semester end and annual examinations are maintained in college library.

5. Institutional Committees are formed to monitor various activities of the institution.

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Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

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Implementation:

Programme wise Academic Calendars and class time tables are displayed in every classroom.

Effective delivery of the content is ensured through various teaching tools and modes of instruction, ICT enhanced teaching is encouraged.

Implementation of curriculum as per the academic schedule is recorded in the teaching notes and attendance registers, which are submitted to the Principal on a regular basis.

Mentor-mentee list is framed.

Student performance is evaluated regularly and continuously through class tests, assignments and mid-examinations.

Practical sessions focus on hands-on experience.

Lab records and performance are continuously assessed.

Syllabus completion is done on time, with sufficient time for revision.

Assessment and evaluation are done based on attainment between CO & PO.

In addition to the curriculum given by the affiliating University, the institution alsoconducts Certificate / Add-on programs to fill the gap between industry and academia.

Eminent academicians and industry associated experts are invited for Guest lectures/ Seminars/ Workshops/ Conferences.

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Regular Review and Action:

1. Academic Planning and Implementation Committee conducts class-wise meetings with mentors adsubject teachers, the Minutes are documented.

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2. A review of student attendance and performance is conducted by the Principal.

In case of any deviation, remedial actions and improvement strategies are formulated.

Feedback from faculty and students at the end of every Semester is analyzed for further improvement.

Institution aims to achieve academic excellence and professional competency by the effective plànning andimplementation of the curriculum as per the guidelines of AICTE, PCI and JNTU Hyderabad..

1.1.2 The institution adheres to the academic calendar including for the conduct of CIE

Response:

Unity college of Pharmacy adheres to and functions as per the academic calendar issued by the affiliating university JNTU Hyderabad. Examination Committee of the institution conducts the internal examinations according to the academic calendar and monitors the evaluation proceedings. The planned dates as mentioned in the academic calendar of the University, JNTU Hyderabad are strictly followed by the institution. As the Semester is initiated, the Academic Planning and Implementation Committee convenes a meeting with the Academic Monitoring Committee and plans the evaluation process of teachinglearning. The plan of action, as given in the academic calendar is implemented. Education regulations are made available to students in the library and on institutional Website which consists of all the particulars of internal/external evaluation, rules of examination and promotion criteria. Semester schedule, theory and practical, text books and reference books are made available to students and syllabus copies are distributed. JNTU Hyderabad academic calendar is displayed on the classroom notice-boards and on the institutional Website.

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Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

PHONE: 08415-200326, 040-27037328
CELL: 9000611217

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The criteria as published in the academic calendar are adhered to, and deviations if any, are informed through circulars by the Principal. The college strictly observes examination rules and the examinations are conducted under CCTV Surveillance.

Setting of question papers, seating arrangement and invigilation duties are taken care of by the

Examination Committee and during lab examinations also strict vigilance is maintained. Students are assessed for their lab work through attendance, Viva-Voce sessions, lab performance and regular submission of observation and record work to the respective faculty. B. Pharm and M. Pharm programmes (Pharmaceutics, and Pharmaceutical Analysis) have Semester pattern. In each Semester, for both theory and practical, two internal assessments are conducted and average

is considered. Attendance, academic activities and student-teacher interaction form the major criteria for continuous internal assessment, apart from the written examination, as per PCI guidelines.

Internal examination theory answer scripts are shown to the students to obtain their signatures on answer booklets to ensure transparency. Any discrepancy is resolved by the course teacher, and in case of any further conflict, is brought to the notice of the Examination Committee Coordinator or otherwise resolved by the Principal.

Question papers, exemplary lab records by the students and teacher manuals are preserved for JNTU Hyderabad and PCI inspections as and when required.

Examination Committee monitors the upload of internal marks to the University which is to be done within the stipulated time. In case of any dissatisfaction with the results in the Semester End Examinations students are given the opportunity of applying for re-evaluation and recounting as per the guidelines offered by the University. Continuous Internal Evaluation ensures that

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Korremula Vill, Vijayapuri Colony,
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PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

E –mail: princeton.pharmacy@gmail.com, pcopaac2007@gmail.com, W

PHONE: 08415-200326, 040-27037328
CELL: 9000611217

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assessment and evaluation are standard and transparent, and enable the students to achieve the minimum number of Credits to get promoted to the next Semester.

PRINCIPAL
Princeton College of Pharmacy,
Korremula (V), Vijayapuri Colony,
Ghatkesar Md., Medchal Dist., Telangana.

E –mail: princeton.pharmacy@gmail.com, pcopaac2007@gmail.com, Website: www.pcop.in

PHONE: 08415-200326, 040-27037328
CELL: 9000611217

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COLLEGE ACADEMIC COMMITTEE

Circular Date:20/1/2017

This is to inform all the members of College Academic Committee that a meeting is scheduled in Board Room on 21/01/2017 at 10:00 am, to discuss the following points.

AGENDA:

I. The College Academic Committee coordinator nomination
2. Preparing College Academic Calendar (activities to be planned)
3. Teaching-learning Process & monitoring.
4. Any other Activities and issues to be discussed

PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

College Academic coordinator

PRINCIPAL

E –mail: princeton.pharmacy@gmail.com, pcopaac2007@gmail.com, Website: www.pcop.in

PHONE: 08415-200326, 040-27037328
CELL: 9000611217

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College Academic Committee Meeting

MINUTES OF MEETING

Date:21/1/2017

A Meeting was held in Board Room on 21/01/2017 to discuss the following points.

1. Coordinator of college academic committee is nominated and the coordinator Assoc. Prof., Ksundeep advised the members to follow and implement the discussed in every department.
2. The academic activities for the present academic year were planned by discussing with the HODS.
3. Faculties are suggested to implement new teaching methods that create interest among students
4. Students must be familiar with all the course outcomes of all subjects.
5. All HODs should plan field visits, Hackathons, Add on Programs, FDPS for the academic year.

Following members attended the meeting:

Name of the Committee	Members	Signature
College Academic Comittee	Mrs. Vaishnavi K. Sundeep Mrs. Sunitha K. Hariprasad	

PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

College Academic coordinator

PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

PRINCIPAL

E –mail: princeton.pharmacy@gmail.com, pcopaac2007@gmail.com, Website: www.pcop.in

PHONE: 08415-200336, 040-27037338
CELL: 9000611217

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COLLEGE ACADEMIC COMMITTEE

Circular Date:20/7/2017

This is to inform all the members of College Academic Committee that a meeting is scheduled in Board Room on 21/07/2017 at 10:00 am, to discuss the following points.

AGENDA:

1. The College Academic Committee coordinator nomination
2. Preparing College Academic Calendar (activities to be planned)
3. Teaching-learning Process & monitoring.
4. Any other Activities and issues to be discussed

College Academic coordinator

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PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana

PRINCIPAL

E –mail: princeton.pharmacy@gmail.com, pcopaac2007@gmail.com, Website: www.pcop.in

PHONE: 08415-200326, 040-27037328
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College Academic Committee Meeting

MINUTES OF MEETING

Date:21/1/2017

A Meeting was held in Board Room on 21/01/2017 to discuss the following points.

I. Coordinator of college academic committee is nominated and the coordinator Assoc. Prof., B.Sudhakar advised the members to follow and implement the discussed in every department.

2. The academic activities for the present academic year were planned by discussing with the HODS.

3. Faculties are suggested to implement new teaching methods that create interest among students

4. Students must be familiar with all the course outcomes of all subjects.

5. All HODs should plan field visits, Hackathons, Add on Programs, FDPS for the academic year.

Following members attended the meeting:

Name of the Committee	Members	Signature
College Academic comitte	Mrs. Vaishnavi K. Sundeep Mrs. Sunitha K. Haiprasad	

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Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

College Academic coordinator

PRINCIPAL

E –mail: princeton.pharmacy@gmail.com, pcopaac2007@gmail.com, Website: www.pcop.in

PHONE: 08415-200326, 040-27037328
CELL: 9000611217

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COLLEGE ACADEMIC COMMITTEE

Circular Date: 03/01/2018

This is to inform all the members of College Academic Committee that a meeting is scheduled in Board Room on 04/01/2018 at 10:00 am, to discuss the following points.

AGENDA:

1. Planning Co-curricular Activities
2. Review of I Semester Academics
3. Planning of Technical & Cultural fest.

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Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

College Academic coordinator

PRINCIPAL

PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

E –mail: princeton.pharmacy@gmail.com, pcopaac2007@gmail.com, Website: www.pcop.in

PHONE: 08415-200326, 040-27037328
CELL: 9000611217

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Date 4/1/2018

MINUTES OF MEETING

A Meeting was held in Board Room on 04/01/2018 to discuss the following points.

1. Planning of co-curricular activities internship, hackathons and conferences were discussed

2.Based on the First Semester results Academic Performance was discussed and the initiatives to be taken to improve the Academic performance were discussed

3.Organising Technical & Cultural Fest planed

Following members attended the meeting:

Name of the Committee	Members	Signature
College Academic Comitte	M. Vaishnavi K. Sundeep Ch. Sunitha K. Hariprasad	

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Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

College Academic coordinator

PRINCIPAL

PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

E –mail: princeton.pharmacy@gmail.com, pcopnac2007@gmail.com, Website: www.pcop.in

PHONE: 08415-200326, 040-27037328
CELL: 9000611217

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Date : 17/07/2018

Circular

This is to inform all the members of College Academic Committee that a meeting is scheduled in Board Room on 18/7/2018 at 10:00 am, to discuss the following points.

AGENDA:

I. Preparing College Academic Calendar (activities to be planned)
2. Teaching-learning Process planning in coordination with IQAC.
3. Result analysis-improvement measures
4. Any other Activities and issues to be discussed

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Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

College Academic coordinator

PRINCIPAL

PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

E –mail: princeton.pharmacy@gmail.com, pcopaac2007@gmail.com, Website: www.pcop.in

PHONE: 08415-200326, 040-27037328
CELL: 9000611217

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Date: 18/07/2018

MINUTES OF MEETING

A Meeting was held in Board Room on 18/07/2018 to discuss the following points.

1. The academic activities for the present academic year were planned by discussing with the HODS.
2. All HODs should plan field visits, Hackathons, Add on Programs, FDPS for the academic year.
3. Improvement of result was discussed.
4. Professional body memberships for students and faculty were discussed.

Following members attended the meeting:

Name of the Committee	Members	Signature
College Academic Comitte	M. Vaishnavi K. Sundeep Ch. Sunitha K. Hariprasad	

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Princeton College of Pharmacy,
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Ghatkesar Mdl,Medchal Dist ,Telangana.

College Academic coordinator

PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

PRINCIPAL

E –mail: princeton.pharmacy@gmail.com, pcopaac2007@gmail.com, Website: www.pcop.in

PHONE: 08415-200326, 040-27037328
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College Academic Committee

Circular Date:08/01/2019

This is to inform all the members of College Academic Committee that a meeting is scheduled in Board Room on 09/01/2019 at 10:00 am, to discuss the following points.

AGENDA:

a. Planning co-curricular activities.
b. Review of I Semester Academic Performance.
c. Planning of Technical & Cultural Fest.
d. Review of memberships of professional bodies.

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Princeton College of Pharmacy,
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Ghatkesar Mdl,Medchal Dist ,Telangana.

College Academic coordinator

PRINCIPAL

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Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

E –mail: princeton.pharmacy@gmail.com, pcopaac2007@gmail.com, Website: www.pcop.in

PHONE: 08415-200326, 040-27037328
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College Academic Committee

MINUTES OF MEETING

Date 9/1/2019

A Meeting was held in Board Room on 09/01/2019 to discuss the following points.

a. Planning co-curricular activities was discussed in coordination with various committees.

b. Review of I Semester Academic Performance was discussed in co-ordination with IQAC.

c. Planning of Technical & Cultural Fest

d. Review of memberships of professional bodies

Following members attended the meeting:

Name of the Committee	Members	Signature
College Academic Comittee	M. Vaishnavi K. Sundeep Ch. Sunitha K. Hasiprasad	

College Academic coordinator

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Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

PRINCIPAL

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PHONE: 08415-200326, 040-27037328
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College Academic Committee

Circular

Date: 25/6/2019

This is to inform all the members of College Academic Committee that a meeting is scheduled in Board Room on 26/6/2019 at 10:00 am, to discuss the following points.

AGENDA:

1. The College Academic Committee coordinator nomination
2. Preparing College Academic Calendar (activities to be planned)
3. Teaching-learning Process & monitoring.
4. Stake Holders feedback analysis.
5. Any other Activities and issues to be discussed

College Academic coordinator

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Princeton College of Pharmacy,
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PRINCIPAL
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Korremula Vill, Vijayapuri Colony,
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PRINCIPAL

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College Academic Committee

Date 26/6/2019

MINUTES OF MEETING

A Meeting was held in Board Room on 26/06/2019 to discuss the following points. Coordinator of college academic committee is nominated and the coordinator Assoc Prof. P.Goverdhan Reddy advised the members to follow and implement the discussed in every department.

1.The academic activities for the present academic year were planned by discussing with the HODS

2. Faculties are suggested to implement new teaching methods that create interest among students

3. Students must be familiar with all the course outcomes of all subjects.

4. After the discussion on feedback analysis, Action plan is prepared based on the feedback collected from the stake holders.

5. All HODs should plan field visits, Hackathons, Add on Programs, FDPS for the academic year.Following members attended the meeting:

Name of the Committee	Members	Signature
College Academic Comitte	Ch. Sunitha Dr. L. Harikiran Shaik. Zareena begum M. Vaishnavi	

College Academic coordinator

PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl Medchal Dist ,Telangana.

E –mail: princeton.pharmacy@gmail.com, pcopaac2007@gmail.com, Website: www.pcop.in

PHONE: 08415-200326, 040-27037328
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College Academic Committee

Date: 02/01/2020

Circular

This is to inform all the members of College Academic Committee that a meeting is going to be held on 04/01/2020 at 10:00 am in Board Room to discuss the following points.

AGENDA:

I. Planning co-curricular activities

2. Review of I Semester Academic Performance.

3 Planning of Technical & Cultural Fest

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Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

College Academic coordinator

PRINCIPAL

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Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

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College Academic Committee

MINUTES OF MEETING

Date 4/1/2020

A Meeting was held in Board Room on 04/01/2020 to discuss the following points.

1.Planning of co-curricular activities internship, hackathons and conferences were discussed

2. Based on the First Semester results Academic Performance wasdiscussed and the initiatives to be taken to improve the Academic performance were discussed

3. Organizing Technical & Cultural Fest is to be planned

Following members attended the meeting:

Name of the Committee	Members	Signature
College Academic committee	Ms. Hema K. Sundeep Ch. Sunitha Ms. Shaik, Tareena begum	Hema

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Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

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Princeton College of Pharmacy,
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College Academic Committee

Date: 20/11/2020

Circular

This is to inform all the members of College Academic Committee that a meeting is going to be held on 21/11/2020 at 10:00 am in Board Room to discuss the following points.

Agenda

> Review of minutes of previous meeting

> Review of course work

- Forth coming MID & UNIVERSITY examination for B.Pharmacy

- National pharmacy week (NPW) celebrations

> IPC conference-staff and students attending.

College Academic coordinator

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PRINCETON COLLEGE OF PHARMACY

(Affiliated to JNTUH & Approved by AICTE, PCI, New Delhi)
Chowdaryguda, Korremula (V), Ghatkesar (M), Medchal (Dist.)-500 088

Date: 21.11.2020

Minutes of the meeting

Following points were discussed and approved

1. It was discussed and decided that the faculty who are left with one or two topics will complete their syllabus during the university practical examination days.
2. It was decided that during the period of university examinations all faculty will prepare their lesson plan & question bank and submit through their HODS before the start of the next semester.
3. It was discussed and planned for IPC by students (24) +staff (3) NPW celebration's is scheduled on 23 November 1:00 p.m.

Following members attended the meeting:

Name of the Committee	Members	Signature
College Academic Committee	K. Sundeep M. Vaishnavi Mrs. Anusha Ms Shaik. Yaseena begum	

College Academic coordinator

PRINCIPAL
Princeton College of Pharmacy
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

PRINCIPAL
Princeton College of Pharmacy.
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

PRINCIPAL

E –mail: princeton.pharmacy@gmail.com, pcopaac2007@gmail.com, Website: www.pcop.in

PHONE: 08415-200326, 040-27037328
CELL: 9000611217

PRINCETON COLLEGE OF PHARMACY

(Affiliated to JNTUH & Approved by AICTE, PCI, New Delhi)
Chowdaryguda, Korremula (V), Ghatkesar (M), Medchal (Dist.)-500 088

College Academic Committee

Date: 02/02/2021

Circular

This is to inform all the members of College Academic Committee that a meeting is going to be held on 03/02/2021 at 10:00 am in Board Room to discuss the following points.

Agenda

> Review of minutes of previous meeting

> Review on Time tables Preparations

➢ Review on Attendance of the students

> Review on teaching plans.

College Academic coordinator

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PRINCETON COLLEGE OF PHARMACY

(Affiliated to JNTUH & Approved by AICTE, PCI, New Delhi)
Chowdaryguda, Korremula (V), Ghatkesar (M), Medchal (Dist.)-500 088

Date :03/02/2021

Minutes of the meeting

1. Time table for the second semester was prepared in consultation with all the teaching staff and briefed the same to the teaching faculty and it was approved.
2. In order to improve the regular attendance of the students to the classes, it was discussed and decided to display attendance of the students on notice board on every 3rd of the following month. Class Teachers to take the responsibility of calling the parents and counseling both students and parents.
3. All teachers here by requested to make their teaching plan and get approved on weekly basis by the vice- principal and on monthly basis by the principal.

Following members attended the meeting:

Name of the Committee	Members	Signature
College Academic Comittee	Dr. L. Harikiran	
	CH. Sunitha	
	K. Hariprasad	
	Ms. Shaik Zareena begum	

College Academic coordinator

PRINCIPAL
Princeton College of Pharmacy,
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PRINCETON COLLEGE OF PHARMACY

(Affiliated to JNTUH & Approved by AICTE, PCI, New Delhi)
Chowdaryguda, Korremula (V), Ghatkesar (M), Medchal (Dist.)-500 088

College Academic Committee

Date: 06-03-2022

Circular

This is to inform all the members of College Academic Committee that a meeting is going to be held on 07/03/2022 at 10:00 am in Board Room to discuss the following points.

- Agenda
  a)Class work for B.pharmacy III/II, IV/II
  b) Beginning of new semester
  c) B.Pharmacy projects works
  d) NAAC work
  e) Miscellaneous

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Princeton College of Pharmacy,
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Ghatkesar Mdl,Medchal Dist ,Telangana.

College Academic coordinator

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PRINCETON COLLEGE OF PHARMACY

(Affiliated to JNTUH & Approved by AICTE, PCI, New Delhi)
Chowdaryguda, Korremula (V), Ghatkesar (M), Medchal (Dist.)-500 088

Date :07/03/2022

Minutes of the meeting

a) Discussion made and reviewed on Class work for B.pharmacy III/II, IV/II

b) Discussion made and reviewed Beginning of new semester

c) Discussion made and reviewed B.Pharmacy projects works

d) Discussion made and reviewed NAAC work

Following members attended the meeting:

Name of the Committee	Members	Signature
College Academic Comittee	N. Ramya D. Lavanya A. Madhusudhan reddy Ch. Anil kumar	

College Academic coordinator

PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

Academic Calendar 2021-22

B. TECH./B.PHARM. III & IV YEARS I & II SEMESTERS

I SEM

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	**06.092021**	
2	1st Spell of Instructions (including Dussehra Recess)	06.09.2021	06.11.2021 (9 Weeks)
3	Dussehra Recess	11.10.2021	16.10.2021 (1 Week)
4	First Mid Term Examinations	08.11.2021	13.11.2021 (1 Week)
5	Submission of First Mid Term Exam Marks to the University on or before	20.11.2021	
6	2nd Spell of Instructions	15.11.2021	08.01.2022 (8 Weeks)
7	Second Mid Term Examinations	10.01.2022	18.01.2022 (1 Week)
8	Preparation Holidays and Practical Examinations	19.01.2022	25.01.2022 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	25.01.2022	
10	End Semester Examinations	27.01.2022	09.02.2022

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	**10.02.2022**	
2	1st Spell of Instructions	10.02.2022	06.04.2022 (8 Weeks)
3	First Mid Term Examinations	07.04.2022	13.04.2022 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	20.04.2022	
5	2nd Spell of Instructions (including Summer Vacation)	16.04.2022	24.06.2022 (10 Weeks)
6	Summer Vacation	09.05.2022	21.05.2022 (2 Weeks)
7	Second Mid Term Examinations	25.06.2022	01.07.2022 (1 Week)
8	Preparation Holidays and Practical Examinations	02.07.2022	09.07.2022 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	09.07.2022	
10	End Semester Examinations	11.07.2022	23.07.2022 (2 Weeks)

REGISTRAR

27/8/21

27/8/21

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

REVISED ACADEMIC CALENDAR 2021-22

B. Tech./B.Pharm. IV YEAR II SEMESTER

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	03.03.2022	
2	1st Spell of Instructions	03.03.2022	30.04.2022 (8 Weeks)
3	First Mid Term Examinations	02.05.2022	07.05.2022 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	14.05.2022	
5	2nd Spell of Instructions	09.05.2022	02.07.2022 (8 Weeks)
6	Second Mid Term Examinations and Preparation Holidays	04.07.2022	09.07.2022 (1 Week)
7	Submission of Second Mid Term Exam Marks to the University on or before	09.07.2022	
8	End Semester Examinations	11.07.2022	16.07.2022 (1 Week)

16/4/22

REGISTRAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

ACADEMIC CALENDAR 2021-22

B. TECH./B.PHARM. II YEAR I & II SEMESTERS

I SEM

S. No	Description	Duration	
		From	To
1	Dussehra Recess	11.10.2021	16.10.2021 (1 Week)
2	Commencement of I Semester classwork	**18.10.2021**	
3	1st Spell of Instructions	18.10.2021	11.12.2021 (8 Weeks)
4	First Mid Term Examinations	13.12.2021	18.12.2021 (1 Week)
5	Submission of First Mid Term Exam Marks to the University on or before	24.12.2021	
6	2nd Spell of Instructions	20.12.2021	12.02.2022 (8 Weeks)
7	Second Mid Term Examinations	14.02.2022	19.02.2022 (1 Week)
8	Preparation Holidays and Practical Examinations	21.02.2022	26.02.2022 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	26.02.2022	
10	End Semester Examinations	28.02.2022	12.03.2022 (2 Weeks)

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	**14.03.2022**	
2	1st Spell of Instructions (including Summer Vacation)	14.03.2022	28.05.2022 (11Weeks)
3	Summer Vacation	09.05.2022	21.05.2022 (2 Weeks)
4	First Mid Term Examinations	30.05.2022	04.06.2022 (1 Week)
5	Submission of First Mid Term Exam Marks to the University on or before	11.06.2022	
6	2nd Spell of Instructions	06.06.2022	30.07.2022 (8 Weeks)
7	Second Mid Term Examinations	01.08.2022	06.08.2022 (1 Week)
8	Preparation Holidays and Practical Examinations	09.08.2022	16.08.2022 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	16.08.2022	
10	End Semester Examinations	17.08.2022	30.08.2022 (2 Weeks)

REGISTRAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

ACADEMIC CALENDAR 2021-22

B. TECH./B.PHARM. I YEAR I & II SEMESTERS

I SEM

S. No	Description	Duration	
		From	To
1	Induction programme	**09.12.2021 to 18.12.2021**	
2	1st Spell of Instructions	20.12.2021	12.02.2022 (8 Weeks)
3	First Mid Term Examinations	14.02.2022	19.02.2022 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	26.02.2022	
5	2nd Spell of Instructions	21.02.2022	23.04.2022 (9 Weeks)
6	Second Mid Term Examinations	25.04.2022	30.04.2022 (1 Week)
7	Preparation Holidays and Practical Examinations	02.05.2022	07.05.2022 (1 Week)
8	Submission of Second Mid Term Exam Marks to the University on or before	07.05.2022	
9	End Semester Examinations	09.05.2022	21.05.2022 (2 Weeks)

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	**23.05.2022**	
2	1st Spell of Instructions	23.05.2022	16.07.2022 (8 Weeks)
3	First Mid Term Examinations	18.07.2022	23.07.2022 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	30.07.2022	
5	2nd Spell of Instructions	26.07.2022	17.09.2022 (8 Weeks)
6	Second Mid Term Examinations	19.09.2022	24.09.2022 (1 Week)
7	Preparation Holidays and Practical Examinations	26.09.2022	01.10.2022 (1 Week)
8	Submission of Second Mid Term Exam Marks to the University on or before	01.10.2022	
9	End Semester Examinations	03.10.2022	18.10.2022 (2 Weeks)

06/12/21

REGISTRAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

ACADEMIC CALENDAR 2021-22

M.Tech./ M.Pharm. I YEAR I & II SEMESTERS

I SEM

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	**15.11.2021**	
2	1st Spell of Instructions	15.11.2021	08.01.2022 (8 Weeks)
3	First Mid Term Examinations	10.01.2022	18.01.2022 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	25.01.2022	
5	2nd Spell of Instructions	19.01.2022	15.03.2022 (8 Weeks)
6	Second Mid Term Examinations	16.03.2022	22.03.2022 (1 Week)
7	Preparation Holidays and Practical Examinations	23.03.2022	29.03.2022 (1 Week)
8	Submission of Second Mid Term Exam Marks to the University on or before	29.03.2022	
9	End Semester Examinations	30.03.2022	16.04.2022 (2 Weeks)

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	**18.04.2022**	
2	1st Spell of Instructions (including Summer Vacation)	18.04.2022	25.06.2022 (10 Weeks)
3	Summer Vacation	09.05.2022	21.05.2022 (2 Weeks)
4	First Mid Term Examinations	27.06.2022	02.07.2022 (1 Week)
5	Submission of First Mid Term Exam Marks to the University on or before	09.07.2022	
6	2nd Spell of Instructions	04.07.2022	27.08.2022 (8 Weeks)
7	Second Mid Term Examinations	29.08.2022	03.09.2022 (1 Week)
8	Preparation Holidays and Practical Examinations	05.09.2022	10.09.2022 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	10.09.2022	
10	End Semester Examinations	12.09.2022	24.09.2022 (2 Weeks)

12/11/21

REGISTRAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
ACADEMIC CALENDAR 2021-22
M.Tech./ M.Pharm. II YEAR I & II SEMESTERS

I SEM

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	**09.11.2021**	
2	1st Spell of Instructions	09.11.2021	31.12.2021 (8 Weeks)
3	Preparation of Project Work Proposals	09.11.2021	04.12.2021 (4 Weeks)
4	Project Work Review–I: (Project approval / commencement)	06.12.2021	11.12.2021
5	Last date for submission of list of approved PRC-I students from the College to the University Examination branch.	14.12.2021	
6	First Mid Term Examinations	03.01.2022	08.01.2022 (1 Week)
7	Submission of First Mid Term Exam Marks to the University on or before	19.01.2022	
8	2nd Spell of Instructions	10.01.2022	05.03.2022 (8 Weeks)
9	Second Mid Term Examinations	07.03.2022	12.03.2022 (1 Week)
10	Preparation Holidays and Practical Examinations	14.03.2022	19.03.2022 (1 Week)
11	Submission of Second Mid Term Exam Marks to the University on or before	19.03.2022	
12	End Semester Examinations	21.03.2022	01.04.2022 (2 Weeks)

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester (Project Work Continuation) (13.12.2021 to 04.04.2022 – 16 weeks)	**04.04.2022**	
2	Project Work Review -II (Phase-I)	04.04.2022	09.04.2022 (1 Week)
3	** Project Work Review -II (Phase-II)	26.04.2022	28.04.2022 (3 days)
4	Last date for submission of PRC-II marks	02.05.2022	
5	Project Work Review -III (Phase –I) (11.04.2022 to 03.09.2022 – 21 Weeks)	05.09.2022	10.09.2022
6	Last date for submission of Project Work Review-III (Phase-I) Marks	17.09.2022	
7	* Date of eligibility of thesis submission	17.09.2022	
8	Submission of Thesis and Project Viva –Voce Examination (PRC-III Phase-I)	--	
9	** Project Work Review – III (Phase –II) (12.09.2022 to 10.12.2022 – 13 Weeks)	12.12.2022	14.12.2022 (3 days)
10	Last date for submission of Project Work Review –III (Phase-II) Marks	15.12.2022	
11	Submission of Thesis and Project Viva –Voce Examination (Phase-II) follows	---	

* After completion of 40 weeks from the date of approval of project work proposal and subject to approval of Project Work Review-III.

** Phase-II will be conducted only for unsuccessful students in Phase –I

Note: 1 The unsuccessful students in Project Work Review-II (Phase-II) shall appear for Project Work Review-II at the time of Project Work Review-III. These students shall reappear for Project Work Review-III in the next academic year at the time of Project Work Review -I only after completion of Project Work Review -II, and then Project Work Review -III follows.

2 The Project Viva-Voce External examination Marks must be submitted on the day of examination to the University.

REGISTRAR

06/9/21

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

Academic Calendar 2021-22

B. TECH./B.PHARM. III & IV YEARS I & II SEMESTERS

I SEM

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	**06.092021**	
2	1st Spell of Instructions (including Dussehra Recess)	06.09.2021	06.11.2021 (9 Weeks)
3	Dussehra Recess	11.10.2021	16.10.2021 (1 Week)
4	First Mid Term Examinations	08.11.2021	13.11.2021 (1 Week)
5	Submission of First Mid Term Exam Marks to the University on or before	20.11.2021	
6	2nd Spell of Instructions	15.11.2021	08.01.2022 (8 Weeks)
7	Second Mid Term Examinations	10.01.2022	18.01.2022 (1 Week)
8	Preparation Holidays and Practical Examinations	19.01.2022	25.01.2022 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	25.01.2022	
10	End Semester Examinations	27.01.2022	09.02.2022

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	**10.02.2022**	
2	1st Spell of Instructions	10.02.2022	06.04.2022 (8 Weeks)
3	First Mid Term Examinations	07.04.2022	13.04.2022 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	20.04.2022	
5	2nd Spell of Instructions (including Summer Vacation)	16.04.2022	24.06.2022 (10 Weeks)
6	Summer Vacation	09.05.2022	21.05.2022 (2 Weeks)
7	Second Mid Term Examinations	25.06.2022	01.07.2022 (1 Week)
8	Preparation Holidays and Practical Examinations	02.07.2022	09.07.2022 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	09.07.2022	
10	End Semester Examinations	11.07.2022	23.07.2022 (2 Weeks)

REGISTRAR

27/8/21

27/8/21

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

REVISED ACADEMIC CALENDAR 2021-22

B. Tech./B.Pharm. I YEAR I & II SEMESTERS

I SEM

S. No	Description	Duration	
		From	To
1	Induction programme	**09.12.2021 to 18.12.2021**	
2	1st Spell of Instructions	20.12.2021	12.02.2022 (7 Weeks)
	Holidays	***08.01.2022***	***16.01.2022***
3	First Mid Term Examinations	14.02.2022	19.02.2022 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	26.02.2022	
5	2nd Spell of Instructions	***21.02.2022***	***30.04.2022 (10 Weeks)***
6	Second Mid Term Examinations	***02.05.2022***	***07.05.2022 (1 Week)***
7	Preparation Holidays and Practical Examinations	***09.05.2022***	***14.05.2022 (1 Week)***
8	Submission of Second Mid Term Exam Marks to the University on or before	***14.05.2022***	
9	End Semester Examinations	***16.05.2022***	***28.05.2022 (2 Weeks)***

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	***30.05.2022***	
2	1st Spell of Instructions	***30.05.2022***	***23.07.2022 (8 Weeks)***
3	First Mid Term Examinations	***26.07.2022***	***30.07.2022 (1 Week)***
4	Submission of First Mid Term Exam Marks to the University on or before	***06.08.2022***	
5	2nd Spell of Instructions	***01.08.2022***	***24.09.2022 (8 Weeks)***
6	Second Mid Term Examinations	***26.09.2022***	***01.10.2022 (1 Week)***
7	Preparation Holidays and Practical Examinations	***03.10.2022***	***08.10.2022 (1 Week)***
8	Submission of Second Mid Term Exam Marks to the University on or before	***08.10.2022***	
9	End Semester Examinations	***10.10.2022***	***22.10.2022 (2 Weeks)***

22/2/22

REGISTRAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

REVISED ACADEMIC CALENDAR 2021-22

B. Tech./B.Pharm. II YEAR I & II SEMESTERS

I SEM

S. No	Description	Duration	
		From	To
1	Dussehra Recess	11.10.2021	16.10.2021 (1 Week)
2	Commencement of I Semester classwork	**18.10.2021**	
3	1st Spell of Instructions	18.10.2021	11.12.2021 (8 Weeks)
4	First Mid Term Examinations	13.12.2021	18.12.2021 (1 Week)
5	Submission of First Mid Term Exam Marks to the University on or before	24.12.2021	
6	2nd Spell of Instructions	20.12.2021	12.02.2022 (8 Weeks)
7	Second Mid Term Examinations	14.02.2022	19.02.2022 (1 Week)
8	***Continuation of 2nd Spell of Instructions***	***21.02.2022***	***26.02.2022 (1 Week)***
9	Practical Classes, Examinations and Preparation Holidays	***28.02.2022***	***05.03.2022 (1 Week)***
10	Submission of Second Mid Term Exam Marks to the University on or before	26.02.2022	
11	End Semester Examinations	***07.03.2022***	***19.03.2022 (2 Weeks)***

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	***21.03.2022***	
2	1st Spell of Instructions (including Summer Vacation)	***21.03.2022***	***28.05.2022 (10 Weeks)***
3	Summer Vacation	***09.05.2022***	***14.05.2022 (1 Week)***
4	First Mid Term Examinations	30.05.2022	04.06.2022 (1 Week)
5	Submission of First Mid Term Exam Marks to the University on or before	11.06.2022	
6	2nd Spell of Instructions	06.06.2022	30.07.2022 (8 Weeks)
7	Second Mid Term Examinations	01.08.2022	06.08.2022 (1 Week)
8	Preparation Holidays and Practical Examinations	08.08.2022	16.08.2022 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	16.08.2022	
10	End Semester Examinations	17.08.2022	30.08.2022 (2 Weeks)

REGISTRAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

REVISED ACADEMIC CALENDAR 2021-22

B. Tech./B.Pharm. III & IV YEARS I & II SEMESTERS

I SEM

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	**06.092021**	
2	1st Spell of Instructions (including Dussehra Recess)	06.09.2021	06.11.2021 (9 Weeks)
3	Dussehra Recess	11.10.2021	16.10.2021 (1 Week)
4	First Mid Term Examinations	08.11.2021	13.11.2021 (1 Week)
5	Submission of First Mid Term Exam Marks to the University on or before	20.11.2021	
6	2nd Spell of Instructions	15.11.2021	08.01.2022 (8 Weeks)
7	Second Mid Term Examinations	02.02.2022	02.02.2022 to 28.02.2022 As per the convenience of the Colleges
8	Practical Examinations		
9	Submission of Second Mid Term Exam Marks to the University on or before	02.03.2022	
10	End Semester Examinations	***09.02.2022***	***02.03.2022***

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	***03.03.2022***	
2	1st Spell of Instructions	***03.03.2022***	***30.04.2022 (8 Weeks)***
3	First Mid Term Examinations	***02.05.2022***	***07.05.2022 (1 Week)***
4	Submission of First Mid Term Exam Marks to the University on or before	***14.05.2022***	
5	Summer Vacation	***09.05.2022***	***14.05.2022 (1 Week)***
6	2nd Spell of Instructions (including Summer Vacation)	***16.05.2022***	***09.07.2022 (8 Weeks)***
7	Second Mid Term Examinations	***11.07.2022***	***16.07.2022 (1 Week)***
8	Preparation Holidays and Practical Examinations	***18.07.2022***	***23.07.2022 (1 Week)***
9	Submission of Second Mid Term Exam Marks to the University on or before	***23.07.2022***	
10	End Semester Examinations	***26.07.2022***	***06.08.2022 (2 Weeks)***

22/12/22

REGISTRAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

REVISED ACADEMIC CALENDAR 2021-22

M.Tech./ M.Pharm. I YEAR I & II SEMESTERS

I SEM

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	**15.11.2021**	
2	1st Spell of Instructions	15.11.2021	08.01.2022 (8 Weeks)
3	First Mid Term Examinations	***As per the convenience of the Colleges***	
4	Submission of First Mid Term Exam Marks to the University on or before	25.01.2022	
5	2nd Spell of Instructions	***17.01.2022***	***19.03.2022 (9 Weeks)***
6	Second Mid Term Examinations	***21.03.2022***	***26.03.2022 (1 Week)***
7	Preparation Holidays and Practical Examinations	***28.03.2022***	***01.04.2022 (1 Week)***
8	Submission of Second Mid Term Exam Marks to the University on or before	***01.04.2022***	
9	End Semester Examinations	***04.04.2022***	***20.04.2022 (2 Weeks)***

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	***21.04.2022***	
2	1st Spell of Instructions (including Summer Vacation)	***21.04.2022***	***25.06.2022 (9 Weeks)***
3	Summer Vacation	***09.05.2022***	***14.05.2022 (1 Week)***
4	First Mid Term Examinations	27.06.2022	02.07.2022 (1 Week)
5	Submission of First Mid Term Exam Marks to the University on or before	09.07.2022	
6	2nd Spell of Instructions	04.07.2022	27.08.2022 (8 Weeks)
7	Second Mid Term Examinations	29.08.2022	03.09.2022 (1 Week)
8	Preparation Holidays and Practical Examinations	05.09.2022	10.09.2022 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	10.09.2022	
10	End Semester Examinations	12.09.2022	24.09.2022 (2 Weeks)

22/12/22

REGISTRAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
REVISED ACADEMIC CALENDAR 2021-22
M.Tech./ M.Pharm. II YEAR I & II SEMESTERS

I SEM

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	**09.11.2021**	
2	1st Spell of Instructions	09.11.2021	31.12.2021 (8 Weeks)
3	Preparation of Project Work Proposals	09.11.2021	04.12.2021 (4 Weeks)
4	Project Work Review–I: (Project approval / commencement)	06.12.2021	11.12.2021
5	Last date for submission of list of approved PRC-I students from the College to the University Examination branch.	14.12.2021	
6	First Mid Term Examinations	03.01.2022	***07.01.2022*** (1 Week)
7	Submission of First Mid Term Exam Marks to the University on or before	19.01.2022	
8	2nd Spell of Instructions	***17.01.2022***	***12.03.2022 (8 Weeks)***
9	Second Mid Term Examinations	***14.03.2022***	***19.03.2022 (1 Week)***
10	Preparation Holidays and Practical Examinations	***21.03.2022***	***26.03.2022 (1 Week)***
11	Submission of Second Mid Term Exam Marks to the University on or before	***26.03.2022***	
12	End Semester Examinations	***28.03.2022***	***09.04.2022 (2 Weeks)***

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester (Project Work Continuation) (13.12.2021 to ***11.04.2022*** – ***17*** weeks)	***11.04.2022***	
2	Project Work Review -II (Phase-I)	***11.04.2022***	***16.04.2022 (1 Week)***
3	** Project Work Review -II (Phase-II)	***05.05.2022***	***07.05.2022 (3 days)***
4	Last date for submission of PRC-II marks	***11.05.2022***	
5	Project Work Review -III (Phase –I) ***(18.04.2022 to 10.09.2022*** – 21 Weeks)	***12.09.2022***	***17.09.2022***
6	Last date for submission of Project Work Review-III (Phase-I) Marks	***24.09.2022***	
7	* Date of eligibility of thesis submission	***24.09.2022***	
8	Submission of Thesis and Project Viva –Voce Examination (PRC-III Phase-I)	---	
9	** Project Work Review – III (Phase –II) (***19.09.2022 to 17.12.2022*** – 13 Weeks)	***19.12.2022***	***21.12.2022 (3 days)***
10	Last date for submission of Project Work Review –III (Phase-II) Marks	***22.12.2022***	
11	Submission of Thesis and Project Viva –Voce Examination (Phase-II) follows	---	

* After completion of 40 weeks from the date of approval of project work proposal and subject to approval of Project Work Review-III.

** Phase-II will be conducted only for unsuccessful students in Phase –I

Note: 1 The unsuccessful students in Project Work Review-II (Phase-II) shall appear for Project Work Review-II at the time of Project Work Review-III. These students shall reappear for Project Work Review-III in the next academic year at the time of Project Work Review -I only after completion of Project Work Review -II, and then Project Work Review -III follows.

2 The Project Viva-Voce External examination Marks must be submitted on the day of examination to the University.

REGISTRAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

REVISED ACADEMIC CALENDAR 2021-22

MBA/MCA I YEAR I & II SEMESTERS

I SEM

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	**09.12.2021**	
2	1st Spell of Instructions	09.12.2021	05.02.2022 (8 Weeks)
3	First Mid Term Examinations	07.02.2022	12.02.2011 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	19.02.2022	
5	2nd Spell of Instructions	14.02.2022	***16.04.2022 (9 Weeks)***
6	Second Mid Term Examinations	***18.04.2022***	***23.04.2022 (1 Week)***
7	Preparation Holidays and Practical Examinations	***25.04.2022***	***30.04.2022 (1 Week)***
8	Submission of Second Mid Term Exam Marks to the University on or before	***30.04.2022***	
9	End Semester Examinations	***02.05.2022***	***17.05.2022 (2 Weeks)***

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	***18.05.2022***	
2	1st Spell of Instructions	***18.05.2022***	***09.07.2022 (8 Weeks)***
3	First Mid Term Examinations	***11.07.2022***	***16.07.2022 (1 Week)***
4	Submission of First Mid Term Exam Marks to the University on or before	***23.07.2022***	
5	2nd Spell of Instructions	***18.07.2022***	10.09.2022 (8 Weeks)
6	Second Mid Term Examinations	12.09.2022	17.09.2022 (1 Week)
7	Preparation Holidays and Practical Examinations	19.09.2022	24.09.2022 (1 Week)
8	Submission of Second Mid Term Exam Marks to the University on or before	24.09.2022	
9	End Semester Examinations	26.09.2022	11.10.2022 (2 Weeks)

REGISTRAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

Revised Academic Calendar 2020-21

For All Constituent & Affiliated Colleges of JNTUH

B. Tech./ B.Pharm. IV Year - II Semester

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	**22.03.2021**	
2	1st Spell of Instructions including First Mid Term Examinations (3 Subjects only)	22.03.2021	01.05.2021 (6Weeks)
3	Submission of First Mid Term Exam Marks to the University on or before	05.05.2021	
4	2nd spell instructions including Second mid-term examinations	03-05-2021	26-06-2021 (8 weeks)
6	Project-work Viva-voce exams and preparation holidays	28-06-2021	30-06-2021
7	Submission of second mid-term exam marks to the University and upload of project-viva exam award lists on or before	02-07-2021	
8	Commencement of IV-II semester examinations	01-07-2021	07-07-2021

Note: Total No. of days: 90 days including Saturdays/Sundays and excluding public holidays.

The colleges are informed to increase the instruction hours per week such that the AICTE specified instruction hours per subject are fully complied with, i.e., 32 hours for each two-credit theory course and 48 hours for each three-credit theory course in IV-II semester. Similar requirement for project work should also be complied with. Further the colleges are informed to upload the details of class-work, i.e. number of hours of classes taken per each subject till 31-05-2021 to the examination branch portal in the excel template given by the examination branch.

05/06/21

REGISTRAR

Phone: Off: +91-40-23152216
Web : www.jntuh.ac.in
E Mail:
manzoorjntu@gmail.com

ACCREDITED BY NAAC
A-GRADE

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

(Established by Govt. Act No. 30 of 2008)

Kukatpally, Hyderabad – 500085, Telangana, India.

Dr. M. Manzoor Hussain
M.Tech., Ph.D.,
Professor of Mechanical Engineering &
REGISTRAR

Lr. No. DAPO/ Continuation of Online Classes /2021 Date: 12.04.2021

To
The Directors/Principals of Constituent, Affiliated and Autonomous Colleges of JNTUH

Sub: 1 JNTUH, Hyderabad – Directorate of Academic & Planning – Continuation of Online Classes for UG/PG I years courses - Reg.
2 Note orders of the Vice-Chancellor dated 12.04.2021.

***

With reference to the subject cited above, it is here by informed the Directors / Principals of all constituent, affiliated and autonomous Colleges of JNTUH as per the State Government directions to continue online classes for all the existing courses and suggested the following for UG & PG - I Year courses:

(i) To conduct Mid exams for UG - I Year I Semester / PG - I Year I Semester, the Principals are requested to make the schedule as per the convenience at the respective college level (online / off-line / blended mode). The Lab Classes / Examinations and End Examinations dates will be scheduled as per State Government directions.

(ii) Online classwork as per the calendar given below for UG & PG - I Year II Semester:

Revised Academic Calendars for B. Tech./ B.Pharm. I Year - II Semester for the academic 2020-21

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	**15.04.2021**	
2	1st Spell of Instructions	15.04.2021	09.06.2021 (8 Weeks)
3	First Mid Term Examinations	10.06.2021	16.06.2021 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	23.06.2021	
5	2nd Spell of Instructions	17.06.2021	11.08.2021 (8 Weeks)
6	Second Mid Term Examinations	12.08.2021	18.08.2021 (1 Week)
7	Preparation Holidays and Practical Examinations	20.08.2021	26.08.2021 (1 Week)
8	Submission of Second Mid Term Exam Marks to the University on or before	26.08.2021	
9	End Semester Examinations	27.08.2021	09.09.2021 (2 Weeks)

Revised Academic Calendars for M.Tech./ M.Pharm. /MBA / MCA-I Year - II Semester for the academic 2020-21

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	**26.04.2021**	
2	1st Spell of Instructions	26.04.2021	19.06.2021 (8 Weeks)
3	First Mid Term Examinations	21.06.2021	26.06.2021 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	03.07.2021	
5	2nd Spell of Instructions	28.06.2021	21.08.2021 (8 Weeks)
6	Second Mid Term Examinations	23.08.2021	28.08.2021 (1 Week)
7	Preparation Holidays and Practical Examinations	30.08.2021	04.09.2021 (1 Week)
8	Submission of Second Mid Term Exam Marks to the University on or before	03.09.2021	
9	End Semester Examinations	06.09.2021	18.09.2021 (2 Weeks)

Pharm. D (Regular) and Pharm.D (PB) courses as per the existing Academic Calendar.

This is for your information and necessary action.

Yours sincerely

REGISTRAR

12/4/21

12/4/21

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

Academic Calendar (2020-21)

For All Constituent& Affiliated Colleges of JNTUH

M.Tech. / M.Pharm. I Year - I & II Semesters

M.Tech./ M. Pharm. I Year - I Semester

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork / Induction Programme	**16.12.2020**	
2	1st Spell of Instructions	16.12.2020	06.02.2021 (8 Weeks)
3	First Mid Term Examinations	08.02.2021	13.02.2021 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	20.02.2021	
5	2nd Spell of Instructions	15.02.2021	10.04.2021 (8 Weeks)
6	Second Mid Term Examinations	12.04.2021	17.04.2021 (1 Week)
7	Practical classes	19.04.2021	24.04.2021 (1 Week)
8	Submission of Second Mid Term Exam Marks to the University on or before	24.04.2021	
9	Preparation Holidays and Practical Examinations	26.04.2021	01.05.2021 (1 Week)
10	End Semester Examinations	03.05.2021	15.05.2021 (2 Weeks)

M.Tech./ M.Pharm. I Year - II Semester

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	**17.05.2021**	
2	1st Spell of Instructions	17.05.2021	10.07.2021 (8 Weeks)
3	First Mid Term Examinations	12.07.2021	17.07.2021 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	24.07.2021	
5	2nd Spell of Instructions	19.07.2021	11.09.2021 (8 Weeks)
6	Second Mid Term Examinations	13.09.2021	18.09.2021 (1 Week)
7	Preparation Holidays and Practical Examinations	20.09.2021	25.09.2021 (1 Week)
8	Submission of Second Mid Term Exam Marks to the University on or before	25.09.2021	
9	End Semester Examinations	27.09.2021	09.10.2021 (2 Weeks)

Note: All the laboratory courses shall be conducted once normalcy is restored.

Sd/- xxxx

Director, Academic & Planning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

REVISED ACADEMIC CALENDAR 2020-21

For All Constituent & Affiliated Colleges of JNTUH

B. Tech./B.Pharm. II, III & IV Years I & II Semesters

B. Tech./B.Pharm. II, III & IV Years - I Semester

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	01.09.2020	
2	1st Spell of Instructions (including Dussehra Recess)	01.09.2020	31.10.2020 (9 Weeks)
3	Dussehra Recess	19.10.2020	24.10.2020
4	End Examinations preparation holidays - Previous Semesters	02.11.2020	04.11.2020 (3 days)
5	2nd Spell of Instructions (including First Mid Term Examinations)	14.12.2020	13.02.2021 (9 Weeks)
6	First Mid Term Examinations	21.12.2020	28.12.2020 (1 Week)
7	Submission of First Mid Term Exam Marks to the University on or before	04.01.2021	
8	Second Mid Term Examinations	15.02.2021	20.02.2021 (1 Week)
9	Practical classes	22.02.2021	27.02.2021 (1 Week)
10	Preparation Holidays and Practical Examinations	01.03.2021	06.03.2021 (1 Week)
11	Submission of Second Mid Term Exam Marks to the University on or before	27.02.2021	
12	End Semester Examinations	08.03.2021	20.03.2021 (2 Weeks)

B. Tech./ B.Pharm. II, III & IV Years - II Semester

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	**22.03.2021**	
2	1st Spell of Instructions	22.03.2021	15.05.2021 (8 Weeks)
3	Summer Vacation	17.05.2021	29.05.2021 (2 Weeks)
4	First Mid Term Examinations	31.05.2021	05.06.2021 (1 Week)
5	Submission of First Mid Term Exam Marks to the University on or before	11.06.2021	
6	2nd Spell of Instructions	07.06.2021	31.07.2021 (8 Weeks)
7	Second Mid Term Examinations	02.08.2021	07.08.2021 (1 Week)
8	Preparation Holidays and Practical Examinations	09.08.2021	14.08.2021 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	14.08.2021	
10	End Semester Examinations	16.08.2021	28.08.2021 (2 Weeks)

Note: 1 All the laboratory courses shall be conducted once normalcy is restored.

2 Regular End Semester Examinations of previous Semester (including lab exams) as per the data received from the Examination branch: 05.11.2020 to 11.12.2020.

Sd/- xxxxxx

DIRECTOR, ACADEMIC & PLANNING

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
Revised Academic Calendar (2020-21)
For All Constituent& Affiliated Colleges of JNTUH
M.Tech. / M.Pharm. II Year - I & II Semesters

M.Tech./ M. Pharm. II Year - I Semester

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	01.09.2020	
2	1st Spell of Instructions (including Dussehra Recess, previous Semester End Examinations)	01.09.2020	16.11.2020 (11 Weeks)
3	Dussehra Recess	19.10.2020	24.10.2020 (1 Week)
4	Preparation of Project Work Proposals	01.09.2020	28.09.2020 (4 Weeks)
5	Project Work Review–I: Project approval (Part-I commencement)	29.09.2020	03.10.2020
6	Last date for submission of list of approved PRC-I students from the College to the University Examination branch.	06.10.2020	
7	2nd Spell of Instructions (including First Mid Term Exams)	17.11.2020	19.01.2021 (9 Weeks)
8	First Mid Term Examinations	14.12.2020	19.12.2020 (1 Week)
9	Submission of First Mid Term Exam Marks to the University on or before	28.12.2020	
10	Second Mid Term Examinations	20.01.2021	25.01.2021 (1 Week)
11	Preparation Holidays	27.01.2021	30.01.2021
12	Submission of Second Mid Term Exam Marks to the University on or before	30.01.2021	
13	End Semester Examinations	01.02.2021	13.02.2021 (2 Weeks)

M.Tech./ M.Pharm. II Year - II Semester

S. No	Description	Duration	
		From	To
1	Commencement of II Semester (Project Work Continuation) (5.10.2020 to 15.02.2021 - 4 Months – Excluding Previous Semesters Examinations)	15.02.2021	
2	Project Work Review -II (Phase-I)	15.02.2021	17.02.2021
3	** Project Work Review -II(Phase-II)	01.03.2021	03.03.2021
4	Last date for submission of PRC-II marks	06.03.2021	
5	Project Work Review -III (Phase –I)	12.07.2021	17.07.2021
6	Last date for submission of Project Work Review-III (Phase-I) Marks	24.07.2021	
7	* Date of eligibility of thesis submission	24.07.2021	
8	Submission of Thesis and Project Viva – Voce Examination (PRC-III Phase-I) follows	--	

9	** Project Work Review – III (Phase –II)	12.10.2021	16.10.2021
10	Last date for submission of Project Work Review –III (Phase-II) Marks	18.10.2021	
11	Submission of Thesis and Project Viva – Voce Examination (Phase-II) follows	---	

* After completion of 40 weeks from the date of approval of project work proposal and subject to approval of Project Work Review-III.

** Phase-II will be conducted only for unsuccessful students in Phase –I

Note:1 The unsuccessful students in Project Work Review-II (Phase-II) shall appear for Project Work Review-II at the time of Project Work Review-III. These students shall reappear for Project Work Review-III in the next academic year at the time of Project Work Review -II only after completion of Project Work Review -II, and then Project Work Review -III follows.

2 The unsuccessful students in Project Work Review -III (Phase-II) shall reappear for Project Work Review -III in the next academic year at the time of Project Work Review –II only.

3 The Project Viva-Voce External examination Marks must be submitted on the day of examination to the University.

4. Regular End Semester Examinations of previous Semester (including lab exams) as per the data received from the Examination branch: 12.10.2020, 31.10.2020, 03.11.2020, 05.11.2020 to 16.11.2020.

Sd/- xxxxxx
DIRECTOR, ACADEMIC & PLANNING

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

ACADEMIC CALENDAR 2020-21

For All Constituent & Affiliated Colleges of JNTUH

B. Tech./B.Pharm. I Year I & II Semesters

(Online Classes)

B. Tech./B.Pharm. I Year - I Semester

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork / Orientation Programme	01.12.2020	
2	1st Spell of Instructions	01.12.2020	23.01.2021 (8 Weeks)
3	First Mid Term Examinations	25.01.2021	30.01.2021 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	06.02.2021	
5	Parent-Teacher Meeting	12.02.2021	
6	2nd Spell of Instructions	01.02.2021	27.03.2021 (8 Weeks)
7	Second Mid Term Examinations (including public holidays)	29.03.2021	06.04.2021 (1 Week)
8	Preparation Holidays and Practical Examinations	07.04.2021	12.04.2021 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	12.04.2021	
10	End Semester Examinations	15.04.2021	29.04.2021 (2 Weeks)

B. Tech./ B.Pharm. I Year - II Semester

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	30.04.2021	
2	1st Spell of Instructions	30.04.2021	24.06.2021 (8 Weeks)
3	First Mid Term Examinations	25.06.2021	30.06.2021 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	05.07.2021	
5	Parent-Teacher Meeting	09.07.2021	
6	2nd Spell of Instructions	01.07.2021	25.08.2021 (8 Weeks)
7	Second Mid Term Examinations	26.08.2021	01.09.2021 (1 Week)
8	Preparation Holidays and Practical Examinations	02.09.2021	08.09.2021 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	08.09.2021	
10	End Semester Examinations	09.09.2021	22.09.2021 (2 Weeks)

Note: All the laboratory courses shall be conducted once normalcy is restored.

REGISTRAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

REVISED ACADEMIC CALENDAR 2020-21

For All Constituent & Affiliated Colleges of JNTUH

B. Tech./B.Pharm. II, III & IV Years I & II Semesters

B. Tech./B.Pharm. II, III & IV Years - I Semester

S. No	Description	Duration	
		From	To
1.	Commencement of I Semester classwork	01.09.2020	
2.	1st Spell of Instructions (including Dussehra Recess)	01.09.2020	31.10.2020 (9 Weeks)
3.	Dussehra Recess	19.10.2020	24.10.2020
4.	First Mid Term Examinations	02.11.2020	07.11.2020 (1 Week)
5.	Submission of First Mid Term Exam Marks to the University on or before	13.11.2020	
6.	Parent-Teacher Meeting	21.11.2020	
7.	2nd Spell of Instructions	09.11.2020	02.01.2021 (8 Weeks)
8.	Second Mid Term Examinations	04.01.2021	09.01.2021 (1 Week)
9.	Preparation Holidays and Practical Examinations	11.01.2021	16.01.2021 (1 Week)
10.	Submission of Second Mid Term Exam Marks to the University on or before	16.01.2021	
11.	End Semester Examinations	18.01.2021	30.01.2021 (2 Weeks)

B. Tech./B.Pharm. II, III & IV Years - II Semester

S. No	Description	Duration	
		From	To
1.	Commencement of II Semester classwork	01.02.2021	
2.	1st Spell of Instructions	01.02.2021	27.03.2021 (8 Weeks)
3.	First Mid Term Examinations	29.03.2021	03.04.2021 (1 Week)
4.	Submission of First Mid Term Exam Marks to the University on or before	09.04.2021	
5.	Parent-Teacher Meeting	17.04.2021	
6.	2nd Spell of Instructions	05.04.2021	29.05.2021 (8 Weeks)
7.	Second Mid Term Examinations	31.05.2021	05.06.2021 (1 Week)
8.	Preparation Holidays and Practical Examinations	07.06.2021	12.06.2021 (1 Week)
9.	Submission of Second Mid Term Exam Marks to the University on or before	12.06.2021	
10.	End Semester Examinations	14.06.2021	26.06.2021 (2 Weeks)
11.	Summer Vacation	28.06.2021	10.07.2021 (2 Weeks)

Note: All the laboratory courses shall be conducted once normalcy is restored.

24/8/2020

REGISTRAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

Academic Calendar (2020-21)

For All Constituent& Affiliated Colleges of JNTUH

M.Tech. / M.Pharm. II Year - I & II Semesters

M.Tech./ M. Pharm. II Year - I Semester

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	01.09.2020	
2	1st Spell of Instructions (including Dussehra Recess)	01.09.2020	31.10.2020 (9 Weeks)
3	Preparation of Project Work Proposals	01.09.2020	28.09.2020 (4 Weeks)
4	Project Work Review–I: Project approval (Part-I commencement)	29.09.2020	03.10.2020
5	Last date for submission of list of approved PRC-I students from the College to the University Examination branch.	06.10.2020	
6	Dussehra Recess	19.10.2020	24.10.2020
7	First Mid Term Examinations	02.11.2020	07.11.2020 (1 Week)
8	Submission of First Mid Term Exam Marks to the University on or before	13.11.2020	
9	Parent-Teacher Meeting	21.11.2020	
10	2nd Spell of Instructions	09.11.2020	02.01.2021 (8 Weeks)
11	Second Mid Term Examinations	04.01.2021	09.01.2021 (1 Week)
12	Preparation Holidays and Practical Examinations	11.01.2021	16.01.2021 (1 Week)
13	Submission of Second Mid Term Exam Marks to the University on or before	16.01.2021	
14	End Semester Examinations	18.01.2021	30.01.2021 (2 Weeks)

M.Tech./ M.Pharm. II Year - II Semester

S. No	Description	Duration	
		From	To
1	Commencement of II Semester (Project Work Continuation) (5.10.2020 to 01.02.2021 - 4 Months)	01.02.2021	
	Project Work Review -II (Phase-I)	01.02.2021	03.02.2021
2	** Project Work Review -II(Phase-II)	15.02.2021	17.02.2021
3	Last date for submission of PRC-II marks	20.02.2021	
4	Project Work Review -III (Phase –I) (04.02.2021 to 26.06.2021 – 21 Weeks)	28.06.2021	03.07.2021
5	Last date for submission of Project Work Review-III (Phase-I) Marks	10.07.2021	
6	* Date of eligibility of thesis submission	10.07.2021	
7	Submission of Thesis and Project Viva – Voce Examination (PRC-III Phase-I) follows	--	

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

ACADEMIC CALENDAR 2020-21

For All Constituent & Affiliated Colleges of JNTUH

B. Tech./B.Pharm. II, III & IV Years I & II Semesters

I SEM

S. No	Description	Duration	
		From	To
1.	Commencement of 1st Semester classwork	24.08.2020	
2.	1st Spell of Instructions	24.08.2020	17.10.2020 (8 Weeks)
3.	Dussehra Recess	19.10.2020	24.10.2020 (1 Week)
4.	First Mid Term Examinations	26.10.2020	31.10.2020 (1 Week)
5.	Submission of First Mid Term Exam Marks to the University on or before	07.11.2020	
6.	Parent-Teacher Meeting	13.11.2020	
7.	2nd Spell of Instructions	02.11.2020	26.12.2020 (8 Weeks)
8.	Second Mid Term Examinations	28.12.2020	02.01.2021 (1 Week)
9.	Preparation Holidays and Practical Examinations	04.01.2021	09.01.2021 (1 Week)
10.	Submission of Second Mid Term Exam Marks to the University on or before	09.01.2021	
11.	End Semester Examinations	11.01.2021	23.01.2021 (2 Weeks)

II SEM

S. No	Description	Duration	
		From	To
1.	Commencement of 2nd Semester classwork	25.01.2021	
2.	1st Spell of Instructions	25.01.2021	20.03.2021 (8 Weeks)
3.	First Mid Term Examinations	22.03.2021	27.03.2021 (1 Week)
4.	Submission of First Mid Term Exam Marks to the University on or before	06.04.2021	
5.	Parent-Teacher Meeting	09.04.2021	
6.	2nd Spell of Instructions	29.03.2021	22.05.2021 (8 Weeks)
7.	Second Mid Term Examinations	24.05.2021	29.05.2021 (1 Week)
8.	Preparation Holidays and Practical Examinations	31.05.2021	05.06.2021 (1 Week)
9.	Submission of Second Mid Term Exam Marks to the University on or before	05.06.2021	
10.	End Semester Examinations	07.06.2021	19.06.2021 (2 Weeks)
11.	Summer Vacation	21.06.2021	10.07.2021 (3 Weeks)

Note: All the laboratory courses shall be conducted once normalcy is restored.

REGISTRAR

26/8/2020

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

ACADEMIC CALENDAR 2020-21

For All Constituent & Affiliated Colleges of JNTUH

B. Tech./B.Pharm. I Year I & II Semesters

(Online Classes)

B. Tech./B.Pharm. I Year - I Semester

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork / Orientation Programme	01.12.2020	
2	1st Spell of Instructions	01.12.2020	23.01.2021 (8 Weeks)
3	First Mid Term Examinations	25.01.2021	30.01.2021 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	06.02.2021	
5	Parent-Teacher Meeting	12.02.2021	
6	2nd Spell of Instructions	01.02.2021	27.03.2021 (8 Weeks)
7	Second Mid Term Examinations (including public holidays)	29.03.2021	06.04.2021 (1 Week)
8	Preparation Holidays and Practical Examinations	07.04.2021	12.04.2021 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	12.04.2021	
10	End Semester Examinations	15.04.2021	29.04.2021 (2 Weeks)

B. Tech./ B.Pharm. I Year - II Semester

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	30.04.2021	
2	1st Spell of Instructions	30.04.2021	24.06.2021 (8 Weeks)
3	First Mid Term Examinations	25.06.2021	30.06.2021 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	05.07.2021	
5	Parent-Teacher Meeting	09.07.2021	
6	2nd Spell of Instructions	01.07.2021	25.08.2021 (8 Weeks)
7	Second Mid Term Examinations	26.08.2021	01.09.2021 (1 Week)
8	Preparation Holidays and Practical Examinations	02.09.2021	08.09.2021 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	08.09.2021	
10	End Semester Examinations	09.09.2021	22.09.2021 (2 Weeks)

Note: All the laboratory courses shall be conducted once normalcy is restored.

REGISTRAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

REVISED ACADEMIC CALENDAR (2019-20)

B. Pharmacy I Year I & II Semesters

I Sem

S. No	EVENT	DATE	Duration
1	Commencement of Instruction	26th Aug. 2019	--
2	Dussehra recess	7th to 19th Oct. 2019	2 weeks
3	First Mid Term Examinations	31st Oct. to 2nd Nov. 2019	--
4	Submission of First Mid Term Exam Marks to University on or before	8th Nov. 2019	--
5	Parent-Teacher Meeting	9th Nov. 2019	--
6	Last date of Instruction	24th Dec. 2019	--
7	Second Mid Term Examinations	27th to 30th Dec. 2019	16 weeks
8	Preparation Holidays and Practical Examinations	31st Dec. 2019 to 7th Jan 2020	1 week
9	Submission of Second Mid Term Exam Marks to University on or before	7th Jan. 2020	--
10	End Semester / Supplementary Examinations	8th to 25th Jan. 2020	2 weeks

II Sem

S. No	EVENT	DATE	Duration
1	Commencement of Instruction	27th Jan. 2020	--
2	First Mid Term Examinations	19th to 21st March 2020	--
3	Submission of First Mid Term Exam Marks to University on or before	28th March 2020	--
4	Parent-Teacher Meeting	11th April 2020	--
5	Last date of Instruction	13th May 2020	--
6	Second Mid Term Examinations	14th to 16th May 2020	16 weeks
7	Preparation Holidays and Practical Examinations	18th to 23rd May 2020	--
8	Submission of Second Mid Term Exam Marks to University on or before	23rd May 2020	--
9	End Semester / Supplementary Examinations	25th May to 6th June 2020	2 weeks
10	Summer Vacation	8th June to 4th July 2020	4 weeks

23.10.2019

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ACADEMIC & PLANNING, JNTUH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
REVISED ACADEMIC CALENDAR (2019-20)
M.Tech. / M.Pharm. I Year - I & II Semesters

M.Tech. / M.Pharm. I Year - I Semester

S. No	EVENT	DATE	Duration
1	Commencement of Instruction	26th Aug. 2019	--
2	Dussehra recess	7th to 19th Oct. 2019	2 weeks
3	First Mid Term Examinations	31st Oct. to 2nd Nov. 2019	--
4	Submission of First Mid Term Exam Marks to University on or before	8th Nov. 2019	--
5	Parent-Teacher Meeting	9th Nov. 2019	--
6	Last date of Instruction	24th Dec. 2019	--
7	Second Mid Term Examinations	27th to 30th Dec. 2019	16 weeks
8	Preparation Holidays and Practical Examinations	31st Dec. 2019 to 7th Jan 2020	1 week
9	Submission of Second Mid Term Exam Marks to University on or before	7th Jan. 2020	--
10	End Semester / Supplementary Examinations	8th to 25th Jan. 2020	2 weeks

M.Tech. / M.Pharm. I Year - II Semester

S. No	EVENT	DATE	Duration
1	Commencement of Instruction	27th Jan. 2020	--
2	First Mid Term Examinations	19th to 21st March 2020	--
3	Submission of First Mid Term Exam Marks to University on or before	28th March 2020	--
4	Parent-Teacher Meeting	11th April 2020	--
5	Last date of Instruction	13th May 2020	--
6	Second Mid Term Examinations	14th to 16th May 2020	16 weeks
7	Practical Examinations	18th to 20th May 2020	--
8	Submission of Second Mid Term Exam Marks to University on or before	20th May 2020	--
9	Summer Vacation	21st May to 30th June 2020	6 weeks
10	End Semester / Supplementary Examinations	1st to 15th July 2020	2 weeks

23.10.19

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

REVISED ACADEMIC CALENDAR (2019-20)

FOR NON-AUTONOMOUS CONSTITUENT& AFFILIATED COLLEGES

B. TECH./B.PHARM. II, III & IV YEARS I & II SEMESTERS

I SEM

S. No	EVENT	DATE	Duration
1	Commencement of Instruction	15th July 2019	--
2	First Mid Term Examinations	12th to 14th Sept. 2019	--
3	Submission of First Mid Term Exam Marks to University on or before	20th Sept. 2019	--
4	Parent-Teacher Meeting	21st Sept. 2019	--
5	Dussehra recess	7th to 19th Oct. 2019	2 weeks
6	Last date of Instruction	20th Nov. 2019	17 weeks
7	Second Mid Term Examinations	21st to 23rd Nov. 2019	--
8	Preparation Holidays and Practical Examinations	25th to 30th Nov. 2019	1 week
9	Submission of Second Mid Term Exam Marks to University on or before	30th Nov. 2019	--
10	End Semester Examinations	2nd to 14th Dec. 2019	2 weeks

II SEM

S. No	EVENT	DATE	Duration
1	Commencement of Instruction	16th Dec. 2019	--
2	First Mid Term Examinations	10th to 12th Feb. 2020	--
3	Submission of First Mid Term Exam Marks to University on or before	19th Feb. 2020	--
4	Parent-Teacher Meeting	14th March 2020	--
5	Last date of Instruction	7th April 2020	16 weeks
6	Second Mid Term Examinations	8th to 11th April 2020	--
7	Preparation Holidays and Practical Examinations	13th to 18th April 2020	1 week
8	Submission of Second Mid Term Exam Marks to University on or before	18th April 2020	--
9	End Semester Examinations	20th April to 2nd May 2020	2 weeks
10	Summer Vacation	4th May to 4th July 2020	9 weeks

21.10.19

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
ACADEMIC CALENDAR (2019-20)
FOR NON-AUTONOMOUS CONSTITUENT & AFFILIATED COLLEGES
M.TECH./M.PHARMACY II YEAR - I & II SEMESTER

M.Tech./M. Pharmacy II Year - I Semester

S. No	EVENT	DATE	Duration
1.	Commencement of III Semester	15th July 2019	--
2.	Preparation of Project Work Proposals	10th Aug. 2019	4 weeks
3.	Project Work Review–I, Project approval (Part-I commencement)	13th to 19th Aug. 2019	--
4.	Last date for submission of list of approved students	20th Aug. 2019	--
5.	Comprehensive Viva-Voce	21st Aug. to 25th Oct. 2019	--
6.	Dussehra recess	7th to 12th Oct. 2019	1 week
7.	Last date for submission of Comprehensive Viva-Voce Marks	28th Oct. 2019	--
8.	Project Work Review -II (Phase-I)	11th to 14th Dec. 2019	--
9.	# Project Work Review -II(Phase-II)	27th to 30th Dec. 2019	--
10.	Last date for submission of PRC-II marks	2nd Jan. 2020	--
11.	**Part-I Duration**	13th Aug. to 14th Dec. 2019	**18 weeks**

M.Tech./M.Pharmacy II Year - II Semester

S. No	EVENT	DATE	Duration
1.	Commencement of IV Semester (Project Work Continuation)	16th Dec. 2019	--
2.	Project Work Review -III (Phase –I)	12th to 16th May 2020	--
3.	Last date for submission of Project Work Review-III (Phase-I) Marks	20th May 2020	--
4.	* Date of eligibility of thesis submission	20th May 2020	--
5.	Submission of Thesis and Project Viva –Voce Examination (Phase-I) follows	---	--
6.	**Part-II Duration**	16th Dec. 2019 to 16th May 2020	**22 weeks**
7.	# Project Work Review – III (Phase –II)	19th to 23rd Aug. 2020	--
8.	Last date for submission of Project Work Review –III (Phase-II) Marks	26th Aug. 2020	--
9.	Submission of Thesis and Project Viva –Voce Examination (Phase-II) follows	---	--

* After completion of 40 weeks from the date of approval of project work proposal and subject to approval of Project Work Review-III.

\# Phase-II will be conducted only for unsuccessful students in Phase –I

Note: 1 The unsuccessful students in Project Work Review-II (Phase-II) shall appear for Project Work Review-II at the time of Project Work Review-III. These students shall reappear for Project Work Review-III in the next academic year at the time of Project Work Review -II only after completion of Project Work Review -II, and then Project Work Review -III follows.

2 The unsuccessful students in Project Work Review -III (Phase-II) shall reappear for Project Work Review -III in the next academic year at the time of Project Work Review –II only.

3 The Project Viva-Voce External examination Marks must be submitted on the day of examination to the University.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

REVISED ACADEMIC CALENDAR (2018-19)

B.PHARMACY I YEAR - I & II SEMESTERS

I SEM

S. No	EVENT	DATE	Duration
1.	Orientation programme	10th & 11th August 2018	
2.	Commencement of Instruction	13th August 2018	--
3.	First Mid Term Examinations	10th to 12th Oct. 2018	--
4.	Dussehra Recess	15th to 20th Oct. 2018	1 week
5.	Submission of First Mid Term Exam Marks to University on or before	26th Oct. 2018	--
6.	Parent-Teacher Meeting	10th Nov. 2018	--
7.	Last date of Instruction	15th Dec. 2018	16 weeks
8.	Second Mid Term Examinations	17th to 19th Dec. 2018	--
9.	Preparation Holidays and Practical Examinations	20th to 28th Dec. 2018	1 week
10.	Submission of Second Mid Term Exam Marks to University on or before	28th Dec. 2018	--
11.	End Semester / Supplementary Examinations	29th Dec. 2018 to 12th Jan.2019	2 weeks

II SEM

S. No	EVENT	DATE	Duration
12.	Commencement of Instruction	16th Jan. 2019	--
13.	First Mid Term Examinations	14th to 16th March 2019	--
14.	Submission of First Mid Term Exam Marks to University on or before	23rd March 2019	--
15.	Parent-Teacher Meeting	13th April 2019	--
16.	Last date of Instruction	11th May 2019	16 weeks
17.	Second Mid Term Examinations	13th to 15th May 2019	--
18.	Summer Vacation	16th May to 1st June 2019	3 weeks
19.	Submission of Second Mid Term Exam Marks to University on or before	23rd May 2019	--
20.	End Semester / Supplementary Examinations	3rd to 22nd June 2019	3 weeks
21.	Practical Examinations	24th to 29th June 2019	1 week
22.	Semester break	1st to 13th July 2019	2 weeks

29/1/19

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ACADEMIC & PLANNING, JNTUH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

REVISED ACADEMIC CALENDAR (2018-19)

FOR NON-AUTONOMOUS CONSTITUENT& AFFILIATED COLLEGES

B. PHARM. II, III & IV YEARS I & II SEMESTERS

I SEM

S. No	EVENT	DATE	Duration
1.	Commencement of Instruction	9th July 2018	--
2.	First Mid Term Examinations	4th to 6th Sept. 2018	--
3.	Submission of First Mid Term Exam Marks to University on or before	15th Sept. 2018	--
4.	Parent-Teacher Meeting	13th Oct. 2018	--
5.	Dussehra recess	15th to 20th Oct. 2018	1 week
6.	Last date of Instruction	10th Nov. 2018	16 weeks
7.	Second Mid Term Examinations	12th to 14th Nov. 2018	--
8.	Preparation Holidays and Practical Examinations	15th to 24th Nov. 2018	1 week
9.	Submission of Second Mid Term Exam Marks to University on or before	24th Nov. 2018	--
10.	End Semester / Supplementary Examinations	26th Nov. to 8th Dec. 2018	2 weeks
11.	Semester Break	10th to 15th Dec. 2018	1 week

II SEM

S. No	EVENT	DATE	Duration
1.	Commencement of Instruction	24th Dec. 2018	--
2.	First Mid Term Examinations	18th to 20th Feb. 2019	--
3.	Submission of First Mid Term Exam Marks to University on or before	27th Feb. 2019	--
4.	Parent-Teacher Meeting	9th March. 2019	--
5.	Last date of Instruction	20th April 2019	16 weeks
6.	Second Mid Term Examinations	22nd to 24th April 2019	--
7.	Preparation Holidays and Practical Examinations	25th April to 4th May 2019	1 week
8.	Submission of Second Mid Term Exam Marks to University on or before	2nd May 2019	--
9.	End Semester / Supplementary Examinations	6th to 18th May 2019	2 weeks
10.	Summer Vacation	20th May to 13th July 2019	8 weeks

DIRECTOR

ACADEMIC & PLANNING, JNTUH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
ACADEMIC CALENDAR (2018-19)
M.PHARM. I YEAR - I & II SEMESTER

I Year - I Semester

S. No	EVENT	DATE	Duration
1.	Commencement of Instruction	9th August 2018	--
2.	First Mid Term Examinations	4th to 6th Oct. 2018	--
3.	Submission of First Mid Term Exam Marks to University on or before	12th Oct. 2018	--
4.	Parent-Teacher Meeting	13th Oct. 2018	--
5.	Dussehra recess	15th to 20th Oct. 2018	1 week
6.	Last date of Instruction	5th Dec. 2018	16 weeks
7.	Second Mid Term Examinations	6th to 8th Dec. 2018	--
8.	Preparation Holidays and Practical Examinations	10th to 15th Dec. 2018	1 week
9.	Submission of Second Mid Term Exam Marks to University on or before	15th Dec. 2018	--
10.	End Semester / Supplementary Examinations	17th to 29th Dec. 2018	2 weeks
11.	Semester Break	31st Dec. 2018 to 5th Jan 2019	1 week

I Year - II Semester

S. No	EVENT	DATE	Duration
1.	Commencement of Instruction	7th Jan. 2019	--
2.	First Mid Term Examinations	5th to 7th March 2019	--
3.	Submission of First Mid Term Exam Marks to University on or before	14th March 2019	--
4.	Parent-Teacher Meeting	13th April 2019	--
5.	Last date of Instruction	1st May 2019	16 weeks
6.	Second Mid Term Examinations	2nd to 4th May 2019	--
7.	Summer Vacation	6th May to 15th June 2019	6 weeks
8.	Submission of Second Mid Term Exam Marks to University on or before	10th May 2019	--
9.	Preparation Holidays and Practical Examinations	17th to 22nd June 2019	1 week
10.	End Semester / Supplementary Examinations	24th June to 6th July 2019	2 weeks
11.	Semester Break	8th to 13th July 2019	1 week

8.8.18

DIRECTOR
ACADEMIC & PLANNING, JNTUH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
ACADEMIC CALENDAR (2018-19)
M.TECH./M.PHARMACY II YEAR - I & II SEMESTER

M.Tech./M. Pharmacy II Year - I Semester

S. No	EVENT	DATE	Duration
1.	Commencement of III Semester	16th July 2018	--
2.	Preparation of Project Work Proposals	11th Aug. 2018	4 weeks
3.	Project Work Review–I, Project approval (Part-I commencement)	13th to 18th Aug. 2018	--
4.	Last date for submission of list of approved students	20th Aug. 2018	--
5.	Comprehensive Viva-Voce	21st Aug. to 25th Oct. 2018	--
6.	Dussehra recess	15th to 20th Oct. 2018	1 week
7.	Last date for submission of Comprehensive Viva-Voce Marks	27th Oct. 2018	--
8.	Project Work Review -II (Phase-I)	12th to 15th Dec. 2018	--
9.	# Project Work Review -II(Phase-II)	27th to 29th Dec. 2018	--
10.	Last date for submission of PRC-II marks	2nd Jan. 2019	--
11.	**Part-I Duration**	13th Aug. to 15th Dec. 2018	**18 weeks**

M.Tech./M.Pharmacy II Year - II Semester

S. No	EVENT	DATE	Duration
1.	Commencement of IV Semester (Project Work Continuation)	17th Dec. 2018	--
2.	Project Work Review -III (Phase –I)	14th to 18th May 2019	--
3.	Last date for submission of Project Work Review-III (Phase-I) Marks	20th May 2019	--
4.	* Date of eligibility of thesis submission	20th May 2019	--
5.	Submission of Thesis and Project Viva –Voce Examination (Phase-I) follows	---	--
6.	**Part-II Duration**	17th Dec. 2018 to 18th May 2019	**22 weeks**
7.	# Project Work Review – III (Phase –II)	21st to 24th Aug. 2019	--
8.	Last date for submission of Project Work Review – III (Phase-II) Marks	26th Aug. 2019	--
9.	Submission of Thesis and Project Viva –Voce Examination (Phase-II) follows	---	--
10.	Last date for Submission of Thesis	26th Oct. 2019	

* After completion of 40 weeks from the date of approval of project work proposal and subject to approval of Project Work Review-III.

\# Phase-II will be conducted only for unsuccessful students in Phase –I

Note: 1. The unsuccessful students in Project Work Review-II (Phase-II) shall appear for Project Work Review-II at the time of Project Work Review-III. These students shall reappear for Project Work Review-III in the next academic year at the time of Project Work Review -II only after completion of Project Work Review -II, and then Project Work Review -III follows.

2. The unsuccessful students in Project Work Review -III (Phase-II) shall reappear for Project Work Review -III in the next academic year at the time of Project Work Review –II only.
3. The Project Viva-Voce External examination Marks must be submitted on the day of examination to the University.

DIRECTOR
ACADEMIC & PLANNING, JNTUH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

ACADEMIC CALENDAR (2017-18)

B.PHARMACY. I YEAR - I & II SEMESTERS

B. Pharmacy I year I Semester

S. No	EVENT	DATE	Duration
1.	Commencement of Instruction	28th Aug. 2017	--
2.	First Mid Term Examinations	26th to 28th Oct. 2017	--
3.	Submission of First Mid Term Exam Marks to University on or before	6th Nov. 2017	--
4.	Dussehra recess	25th to 30th Sept. 2017	1 week
5.	Parent-Teacher Meeting	11th Nov. 2017	--
6.	Second Mid Term Examinations	21st to 23rd Dec. 2017	--
7.	Last date of Instruction	23rd Dec. 2017	16 weeks
8.	Preparation Holidays and Practical Examinations	27th Dec. 2017 to 3rd Jan. 2018	1 week
9.	Submission of Second Mid Term Exam Marks to University on or before	6th Jan. 2018	--
10.	End Semester & Supplementary Examinations and Supplementary Examinations for II Sem.	4th to 20th Jan. 2018	2 weeks (14 working days)

B. Pharmacy I year II Semester

S. No	EVENT	DATE	Duration
1.	Commencement of Instruction	22nd Jan. 2018	--
2.	First Mid Term Examinations	15th to 17th March 2018	--
3.	Submission of First Mid Term Exam Marks to University on or before	24th March 2018	--
4.	Parent-Teacher Meeting	14th April 2018	--
5.	Summer Vacation	8th May to 2nd June 2018	4 weeks
6.	Second Mid Term Examinations	6th to 8th June 2018	--
7.	Last date of Instruction	8th June 2018	16 weeks
8.	Submission of Second Mid Term Exam Marks to University on or before	19th June 2018	--
9.	Preparation Holidays and Practical Examinations	18th to 23rd June 2018	1 week
10.	End Semester / Supplementary Examinations and Supplementary Examinations for I Sem. of I year R16 & R17 and for I year of R09, R13 and R15 Regulations.	26th June to 13th July 2018	3 weeks (14 working days)

DIRECTOR
ACADEMIC & PLANNING, JNTUH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
ACADEMIC CALENDAR (2017-18)
FOR NON-AUTONOMOUS CONSTITUENT & AFFILIATED COLLEGES
B. TECH. & B. PHARM. II, III & IV YEARS I & II SEMESTERS

I SEM

S. No	EVENT	DATE	Duration
1.	Commencement of Instruction	12th July 2017	--
2.	First Mid Term Examinations	6th to 8th Sept. 2017	--
3.	Submission of First Mid Term Exam Marks to University on or before	16th Sept. 2017	--
4.	Dussehra recess	25th to 30th Sept. 2017	1 week
5.	Parent-Teacher Meeting	14th Oct. 2017	--
6.	Second Mid Term Examinations	8th to 10th Nov. 2017	--
7.	Last date of Instruction	10th Nov. 2017	16 weeks
8.	Preparation Holidays and Practical Examinations	13th to 18th Nov. 2017	1 week
9.	Submission of Second Mid Term Exam Marks to University on or before	18th Nov. 2017	--
10.	End Semester & Supplementary Examinations (II Sem. of I, II & III years)	20th Nov. to 12th Dec. 2017	3 weeks

II SEM

S. No	EVENT	DATE	Duration
1.	Commencement of Instruction	14th Dec. 2017	--
2.	First Mid Term Examinations	7th to 9th Feb. 2018	--
3.	Submission of First Mid Term Exam Marks to University on or before	17th Feb. 2018	--
4.	Parent-Teacher Meeting	10th March 2018	--
5.	Second Mid Term Examinations	4th to 7th April 2018	--
6.	Last date of Instruction	7th April 2018	16 weeks
7.	Submission of Second Mid Term Exam Marks to University on or before	13th April 2018	--
8.	Preparation Holidays and Practical Examinations	9th to 14th April 2018	1 week
9.	End Semester & Supplementary Examinations (I Sem. of II, III & IV years)	16th April to 7th May 2018	3 weeks
10.	Summer Vacation	8th May to 7th July 2018	9 weeks

DIRECTOR
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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

ACADEMIC CALENDAR (2017-18)

M.TECH./M.PHARM. I YEAR - I & II SEMESTERS

M.TECH./M.PHARM. I YEAR - I SEMESTER

S. No	EVENT	DATE	Duration
1.	Commencement of Instruction	28th Aug. 2017	--
2.	First Mid Term Examinations	26th to 28th Oct. 2017	--
3.	Submission of First Mid Term Exam Marks to University on or before	6th Nov. 2017	--
4.	Dussehra recess	25th to 30th Sept. 2017	1 week
5.	Parent-Teacher Meeting	11th Nov. 2017	--
6.	Second Mid Term Examinations	21st to 23rd Dec. 2017	--
7.	Last date of Instruction	23rd Dec. 2017	16 weeks
8.	Preparation Holidays and Practical Examinations	27th Dec. 2017 to 3rd Jan. 2018	1 week
9.	Submission of Second Mid Term Exam Marks to University on or before	6th Jan. 2018	--
10.	End Semester & Supplementary Examinations	4th to 20th Jan. 2018	2 weeks (14 working days)

M.TECH./M.PHARM. I YEAR - II SEMESTER

S. No	EVENT	DATE	Duration
1.	Commencement of Instruction	22nd Jan. 2018	--
2.	First Mid Term Examinations	15th to 17th March 2018	--
3.	Submission of First Mid Term Exam Marks to University on or before	24th March 2018	--
4.	Parent-Teacher Meeting	14th April 2018	--
5.	Summer Vacation	8th May to 2nd June 2018	4 weeks
6.	Second Mid Term Examinations	6th to 8th June 2018	--
7.	Last date of Instruction	8th June 2018	16 weeks
8.	Submission of Second Mid Term Exam Marks to University on or before	19th June 2018	--
9.	Preparation Holidays and Practical Examinations	18th to 23rd June 2018	1 week
10.	End Semester / Supplementary Examinations and Supplementary Examinations for I Sem.	26th June to 13th July 2018	3 weeks (14 working days)

DIRECTOR
ACADEMIC & PLANNING, JNTUH

PRINCETON COLLE OF PHARMACY
ACADEMIC CALENDER

PRINCETON COLLEGE OF PHARMACY

Vijayapuri colony Chowdaryguda (V), Ghatkesar (M), Medchal (D), TS-500088(Affiliated to JNTUH, Hyderabad & Approved by AICTE, PCI, New Delhi)

COLLEGE ACADEMIC CALENDER FOR THE ACADEMIC YEAR 2021-22

MONDAY	6th SEP 2021	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - II SEM / COMMENCEMENT CLASSWORK FOR III, IV YEAR I SEM / I SPELL OF INSTRUCTION TO III, IV YEAR - I SEM
TUESDAY	7th SEP 2021	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - II SEM
WEDNESDAY	8th SEP 2021	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - II SEM / SUBMISSION OF SECOND MID TERM EXAM FOR I, II,III, IV YEAR - II SEM
THURSDAY	9th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM / COMMENNCEMENT OF CLASSWORK FOR III , IV YEAR I SEM
FRIDAY	10th SEP 2021	VINAYAKA CHAVATHI
SATURDAY	11th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
SUNDAY	12th SEP 2021	SUNDAY
MONDAY	13th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
TUESDAY	14th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
WEDNESDAY	15th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
THURSDAY	16th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
FRIDAY	17th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
SATURDAY	18th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
SUNDAY	19th SEP 2021	SUNDAY
MONDAY	20th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
TUESDAY	21th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
WEDNESDAY	22th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
THURSDAY	23th SEP 2021	CLASS WORK ACTIVITY
FRIDAY	24th SEP 2021	CLASS WORK ACTIVITY
SATURDAY	25th SEP 2021	CLASS WORK ACTIVITY/PHARMACIST DAY
SUNDAY	26th SEP 2021	SUNDAY
MONDAY	27th SEP 2021	CLASS WORK ACTIVITY
TUESDAY	28th SEP 2021	CLASS WORK ACTIVITY
WEDNESDAY	29th SEP 2021	CLASS WORK ACTIVITY
THURSDAY	30th SEP 2021	CLASS WORK ACTIVITY
FRIDAY	1st OCT 2021	SWACHH BHARATH ABHIYANN
SATURDAY	2nd OCT 2021	MAHATMA GANDHI JAYATHI
SUNDAY	3rd OCT 2021	SUNDAY
MONDAY	4th OCT 2021	CLASS WORK ACTIVITY
TUESDAY	5th OCT 2021	CLASS WORK ACTIVITY
WEDNESDAY	6th OCT 2021	BHATUKUMMA CELEBRATIONS
THURSDAY	7th OCT 2021	CLASS WORK ACTIVITY
FRIDAY	8th OCT 2021	CLASS WORK ACTIVITY
SATURDAY	9th OCT 2021	SECOND SATURDAY
SUNDAY	10th OCT 2021	SUNDAY
MONDAY	11th OCT 2021	DUSSEHRA RECESS II,III,IV YEAR I SEM
TUESDAY	12th OCT 2021	DUSSEHRA RECESS II,III,IV YEAR I SEM
WEDNESDAY	13th OCT 2021	DUSSEHRA RECESS II,III,IV YEAR I SEM
THURSDAY	14th OCT 2021	BHATUKUMMA ENDING DAY
FRIDAY	15th OCT 2021	DUSSERA
SATURDAY	16th OCT 2021	VIJAYA DASHMI
SUNDAY	17th OCT 2021	SUNDAY
MONDAY	18th OCT 2021	COMMENCEMENT OF II YEAR -I SEM / I SPELL OF INSTRUCTION FOR II YEAR I SEM
TUESDAY	19th OCT 2021	EID MILADIN NABI
WEDNESDAY	20th OCT 2021	CLASS WORK ACTIVITY
THURSDAY	21th OCT 2021	CLASS WORK ACTIVITY
FRIDAY	22th OCT 2021	CLASS WORK ACTIVITY
SATURDAY	23th OCT 2021	CLASS WORK ACTIVITY
SUNDAY	24th OCT 2021	SUNDAY
MONDAY	25th OCT 2021	CLASS WORK ACTIVITY
TUESDAY	26th OCT 2021	CLASS WORK ACTIVITY

WEDNESDAY	27th OCT 2021	CLASS WORK ACTIVITY
THURSDAY	28th OCT 2021	CLASS WORK ACTIVITY
FRIDAY	29th OCT 2021	CLASS WORK ACTIVITY
SATURDAY	30th OCT 2021	NATIONAL UNITY DAY / CLASS WORK ACTIVITY
SUNDAY	31th OCT 2021	SUNDAY
MONDAY	1st NOV 2021	CLASS WORK ACTIVITY
TUESDAY	2nd NOV 2021	CLASS WORK ACTIVITY
WEDNESDAY	3rd NOV 2021	CLASS WORK ACTIVITY
THURSDAY	4th NOV 2021	DIWALI
FRIDAY	5th NOV 2021	CLASS WORK ACTIVITY
SATURDAY	6th NOV 2021	CLASS WORK ACTIVITY
SUNDAY	7th NOV 2021	SUNDAY
MONDAY	8th NOV 2021	FIRST MID TERM EXAM FOR III, IV YEAR -I SEM
TUESDAY	9th NOV 2021	FIRST MID TERM EXAM FOR III, IV YEAR -I SEM
WEDNESDAY	10th NOV 2021	FIRST MID TERM EXAM FOR III, IV YEAR -I SEM
THURSDAY	11th NOV 2021	FIRST MID TERM EXAM FOR III, IV YEAR -I SEM
FRIDAY	12th NOV 2021	FIRST MID TERM EXAM FOR III, IV YEAR -I SEM
SATURDAY	13th NOV 2021	FIRST MID TERM EXAM FOR III, IV YEAR -I SEM
SUNDAY	14th NOV 2021	SUNDAY
MONDAY	15th NOV 2021	II SPELL INSTRUCTION FOR III, IV YEAR -ISEM STARTING
TUESDAY	16th NOV 2021	COVID VACCINATION DRIVE
WEDNESDAY	17th NOV 2021	CLASS WORK ACTIVITY
THURSDAY	18th NOV 2021	CLASS WORK ACTIVITY
FRIDAY	19th NOV 2021	GURUNANK/ KARTHIKA PURNAMI
SATURDAY	20th NOV 2021	CLASS WORK ACTIVITY/SUBMISSION OF FIRST MID EXAM MARKS TO UNIVERSITY III, IV YEAR I SEM
SUNDAY	21th NOV 2021	SUNDAY
MONDAY	22th NOV 2021	CLASS WORK ACTIVITY
TUESDAY	23th NOV 2021	CLASS WORK ACTIVITY
WEDNESDAY	24th NOV 2021	CLASS WORK ACTIVITY
THURSDAY	25th NOV 2021	CLASS WORK ACTIVITY
FRIDAY	26th NOV 2021	CLASS WORK ACTIVITY
SATURDAY	27th NOV 2021	CLASS WORK ACTIVITY
SUNDAY	28th NOV 2021	SUNDAY
MONDAY	29th NOV 2021	CLASS WORK ACTIVITY
TUESDAY	30th NOV 2021	CLASS WORK ACTIVITY
WEDNESDAY	1st DEC 2021	CLASS WORK ACTIVITY
THURSDAY	2nd DEC 2021	CLASS WORK ACTIVITY
FRIDAY	3rd DEC 2021	CLASS WORK ACTIVITY
SATURDAY	4th DEC 2021	CLASS WORK ACTIVITY
SUNDAY	5th DEC 2021	SUNDAY
MONDAY	6th DEC 2021	CLASS WORK ACTIVITY
TUESDAY	7th DEC 2021	CLASS WORK ACTIVITY
WEDNESDAY	8th DEC 2021	CLASS WORK ACTIVITY
THURSDAY	9th DEC 2021	INDUCTION PROGRAMME I YEAR - I SEM STARTING
FRIDAY	10th DEC 2021	CLASS WORK ACTIVITY
SATURDAY	11th DEC 2021	SECOND SATURDAY / I SPELL OF INSTRUCTION FOR II YEAR I SEM ENDING
SUNDAY	12th DEC 2021	SUNDAY
MONDAY	13th DEC 2021	FIRST MID TERM EXAM FOR II YEAR -I SEM
TUESDAY	14th DEC 2021	FIRST MID TERM EXAM FOR II YEAR -I SEM
WEDNESDAY	15th DEC 2021	FIRST MID TERM EXAM FOR II YEAR -I SEM
THURSDAY	16th DEC 2021	FIRST MID TERM EXAM FOR II YEAR -I SEM
FRIDAY	17th DEC 2021	FIRST MID TERM EXAM FOR II YEAR -I SEM
SATURDAY	18th DEC 2021	INDUCTION PROGRAMME I YEAR - I SEM ENDING / FIRST MID TERM EXAM FOR II YEAR -I SEM
SUNDAY	19th DEC 2021	SUNDAY
MONDAY	20th DEC 2021	I SPELL INSTRUCTION FOR I YEAR -IISEM STARTING / II SPELL OF INSTRUCTION FOR II YEAR I SEM STARTING
TUESDAY	21th DEC 2021	CLASS WORK ACTIVITY
WEDNESDAY	22th DEC 2021	CLASS WORK ACTIVITY
THURSDAY	23th DEC 2021	CLASS WORK ACTIVITY

FRIDAY	24th DEC 2021	CLASS WORK ACTIVITY / SUBMISSION OF FIRST MID TERM EXAM FOR II YEAR - I SEM
SATURDAY	25th DEC 2021	CHIRSTMAS
SUNDAY	26th DEC 2021	SUNDAY/ BOXING DAY
MONDAY	27th DEC 2021	CLASS WORK ACTIVITY
TUESDAY	28th DEC 2021	CLASS WORK ACTIVITY
WEDNESDAY	29th DEC 2021	CLASS WORK ACTIVITY
THURSDAY	30th DEC 2021	CLASS WORK ACTIVITY
FRIDAY	31th DEC 2021	CLASS WORK ACTIVITY
SATURDAY	1st JAN 2022	NEW YEAR
SUNDAY	2nd JAN 2022	SUNDAY
MONDAY	3rd JAN 2022	CLASS WORK ACTIVITY
TUESDAY	4th JAN 2022	CLASS WORK ACTIVITY
WEDNESDAY	5th JAN 2022	CLASS WORK ACTIVITY
THURSDAY	6th JAN 2022	CLASS WORK ACTIVITY
FRIDAY	7th JAN 2022	CLASS WORK ACTIVITY
SATURDAY	8th JAN 2022	CLASS WORK ACTIVITY / II SPELL FOR III IV YEAR - I SEM ENDING
SUNDAY	9th JAN 2022	SUNDAY
MONDAY	10th JAN 2022	SECOND MID TERM EXAM FOR III, IV YEAR I SEM
TUESDAY	11th JAN 2022	SECOND MID TERM EXAM FOR III, IV YEAR I SEM
WEDNESDAY	12th JAN 2022	SECOND MID TERM EXAM FOR III, IV YEAR I SEM / NATIONAL YOUTH DAY
THURSDAY	13th JAN 2022	SECOND MID TERM EXAM FOR III, IV YEAR I SEM
FRIDAY	14th JAN 2022	BHOGI
SATURDAY	15th JAN 2022	SANKRATHI
SUNDAY	16th JAN 2022	SUNDAY
MONDAY	17th JAN 2022	SECOND MID TERM EXAM FOR III, IV YEAR I SEM
TUESDAY	18th JAN 2022	SECOND MID TERM EXAM FOR III, IV YEAR I SEM
WEDNESDAY	19th JAN 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR III , IV YEAR -I SEM
THURSDAY	20th JAN 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR III , IV YEAR -I SEM
FRIDAY	21st JAN 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR III , IV YEAR -I SEM
SATURDAY	22nd JAN 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR III , IV YEAR -I SEM
SUNDAY	23rd JAN 2022	SUNDAY
MONDAY	24th JAN 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR III , IV YEAR ,I SEM /
TUESDAY	25th JAN 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR III , IV YEAR ,I SEM / NATIONAL VOTER DAY
WEDNESDAY	26th JAN 2022	REPUBLIC DAY
THURSDAY	27th JAN 2022	END SEMESTER EXAM FOR III , IV YEAR -I SEM
FRIDAY	28th JAN 2022	END SEMESTER EXAM FOR III , IV YEAR -I SEM
SATURDAY	29th JAN 2022	END SEMESTER EXAM FOR III , IV YEAR -I SEM
SUNDAY	30th JAN 2022	SUNDAY
MONDAY	31st JAN 2022	END SEMESTER EXAM FOR III , IV YEAR -I SEM
TUESDAY	1st FEB 2022	END SEMESTER EXAM FOR III , IV YEAR -I SEM
WEDNESDAY	2nd FEB 2022	END SEMESTER EXAM FOR III , IV YEAR -I SEM
THURSDAY	3rd FEB 2022	END SEMESTER EXAM FOR III , IV YEAR -I SEM
FRIDAY	4th FEB 2022	END SEMESTER EXAM FOR III , IV YEAR -I SEM
SATURDAY	5th FEB 2022	END SEMESTER EXAM FOR III , IV YEAR -I SEM
SUNDAY	6th FEB 2022	SUNDAY
MONDAY	7th feb 2022	END SEMESTER EXAM FOR III , IV YEAR -I SEM
TUESDAY	8th FEB 2022	END SEMESTER EXAM FOR III , IV YEAR -I SEM
WEDNESDAY	9th feb 2022	END SEMESTER EXAM FOR III , IV YEAR -I SEM
THURSDAY	10th FEB 2022	COMMENCEMENT FOR III, IV YEAR II SEM / I SPELL III, IV YEAR II SEM STARTING
FRIDAY	11th FEB 2022	
SATURDAY	12th FEB 2022	SECOND SATURDAY / I SPELL OF INSTRUCTION I YEAR I SEM
SUNDAY	13th FEB 2022	SUNDAY

MONDAY	14th FEB 2022	FIRST MID TERM EXAM FOR I YEAR I SEM/ SECOND MID TERM EXAM FOR II YEAR I SEM
TUESDAY	15th FEB 2022	FIRST MID TERM EXAM FOR I YEAR I SEM/ SECOND MID TERM EXAM FOR II YEAR I SEM
WEDNESDAY	16th FEB 2022	FIRST MID TERM EXAM FOR I YEAR I SEM/ SECOND MID TERM EXAM FOR II YEAR I SEM / ONLINE WEBINAR ON START-UP IN INDUSTRY
THURSDAY	17th FEB 2022	FIRST MID TERM EXAM FOR I YEAR I SEM/ SECOND MID TERM EXAM FOR II YEAR I SEM
FRIDAY	18th FEB 2022	FIRST MID TERM EXAM FOR I YEAR I SEM/ SECOND MID TERM EXAM FOR II YEAR I SEM
SATURDAY	19th FEB 2022	FIRST MID TERM EXAM FOR I YEAR I SEM / II SPELL OF INSTRUCTION FOR II YEAR I SEM ENDING/ SECOND MID TERM EXAM FOR II YEAR I SEM
SUNDAY	20th FEB 2022	SUNDAY
MONDAY	21th FEB 2022	II SPELL OF INSTRUCTION STARTING I YEAR I SEM / PREPARATION HOLIDAY AND PRACTICAL EXAM FOR II YEAR I SEM
TUESDAY	22th FEB 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR II YEAR I SEM
WEDNESDAY	23th FEB 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR II YEAR I SEM
THURSDAY	24th FEB 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR II YEAR I SEM
FRIDAY	25th FEB 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR II YEAR I SEM
SATURDAY	26th FEB 2022	SUBMISSION OF FIRST MID TERM EXAM MARKS TO UNIVERSITY I YEAR I SEM AND II YEAR I SEM SECOND MID / PREPARATION HOLIDAY AND PRACTICAL EXAM FOR II YEAR I SEM
SUNDAY	27th FEB 2022	SUNDAY
MONDAY	28th FEB 2022	END SEMESTER EXAM FOR II YEAR I SEM
TUESDAY	1st MAR 2022	MAHASHIVARATHRI
WEDNESDAY	2nd MAR 2022	END SEMESTER EXAM FOR II YEAR I SEM
THURSDAY	3rd MAR 2022	END SEMESTER EXAM FOR II YEAR I SEM
FRIDAY	4th MAR 2022	END SEMESTER EXAM FOR II YEAR I SEM
SATURDAY	5th MAR 2022	END SEMESTER EXAM FOR II YEAR I SEM
SUNDAY	6th MAR 2022	SUNDAY
MONDAY	7th MAR 2022	END SEMESTER EXAM FOR II YEAR I SEM
TUESDAY	8th MAR 2022	END SEMESTER EXAM FOR II YEAR I SEM / INTERNATIONAL WOMENS'S DAY
WEDNESDAY	9th MAR 2022	END SEMESTER EXAM FOR II YEAR I SEM
THURSDAY	10th MAR 2022	END SEMESTER EXAM FOR II YEAR I SEM
FRIDAY	11th MAR 2022	END SEMESTER EXAM FOR II YEAR I SEM
SATURDAY	12th MAR 2022	END SEMESTER EXAM FOR II YEAR I SEM
SUNDAY	13th MAR 2022	SUNDAY
MONDAY	14th MAR 2022	COMMENNCEMENT OF CLASSWORK FOR II YEAR II SEM / I SPELL OF INSTRUCTION FOR II YEAR II SEM
TUESDAY	15th MAR 2022	CLASS WORK ACTIVITY
WEDNESDAY	16th MAR 2022	CLASS WORK ACTIVITY
THURSDAY	17th MAR 2022	CLASS WORK ACTIVITY
FRIDAY	18th MAR 2022	CLASS WORK ACTIVITY
SATURDAY	19th MAR 2022	CLASS WORK ACTIVITY
SUNDAY	20th MAR 2022	SUNDAY
MONDAY	21st MAR 2022	CLASS WORK ACTIVITY
TUESDAY	22nd MAR 2022	CLASS WORK ACTIVITY
WEDNESDAY	23rd MAR 2022	CLASS WORK ACTIVITY
THURSDAY	24th MAR 2022	CLASS WORK ACTIVITY
FRIDAY	25th MAR 2022	CLASS WORK ACTIVITY
SATURDAY	26th MAR 2022	CLASS WORK ACTIVITY
SUNDAY	27th MAR 2022	SUNDAY
MONDAY	28th MAR 2022	CLASS WORK ACTIVITY
TUESDAY	29th MAR 2022	CLASS WORK ACTIVITY
WEDNESDAY	30th MAR 2022	CLASS WORK ACTIVITY
THURSDAY	31st MAR 2022	CLASS WORK ACTIVITY
FRIDAY	1st APR 2022	CLASS WORK ACTIVITY
SATURDAY	2nd APR 2022	UGADI
SUNDAY	3rd APR 2022	SUNDAY
MONDAY	4th APR 2022	CLASS WORK ACTIVITY

TUESDAY	5th APR 2022	BABU JAGIJI RAM BIRTHDAY
WEDNESDAY	6th APR 2022	I SPELL III, IV YEAR II SEM ENDING
THURSDAY	7th APR 2022	FIRST MID TERM EXAM FOR III , IV YEAR II SEM
FRIDAY	8th APR 2022	FIRST MID TERM EXAM FOR III , IV YEAR II SEM
SATURDAY	9th APR 2022	SECOND SATURDAY
SUNDAY	10th APR 2022	SUNDAY.SRI RAMA NAVAMI
MONDAY	11th APR 2022	FIRST MID TERM EXAM FOR III , IV YEAR II SEM
TUESDAY	12th APR 2022	FIRST MID TERM EXAM FOR III , IV YEAR II SEM
WEDNESDAY	13th APR 2022	I SPELL III, IV YEAR II SEM STARTING
THURSDAY	14th APR 2022	Dr. BR AMBEDKAR BIRTHDAY
FRIDAY	15th APR 2022	GOOD FIRDAY
SATURDAY	16th APR 2022	II SPELL III, IV YEAR II SEM STARTING
SUNDAY	17th APR 2022	SUNDAY
MONDAY	18th APR 2022	CLASS WORK ACTIVITY
TUESDAY	19th APR 2022	CLASS WORK ACTIVITY
WEDNESDAY	20th APR 2022	SUBMISSION OF FIRST MID TERM EXAM MARKS FOR III,IV YEAR -II SEM TO UNIVERSITY
THURSDAY	21st APR 2022	Seminar
FRIDAY	22nd APR 2022	POSTER PRESENTATION MOTHER EARTH
SATURDAY	23rd APR 2022	II SPELL OF INSTRUCTION ENDING
SUNDAY	24th APR 2022	SUNDAY
MONDAY	25th APR 2022	SECOND MID TERM EXAM FOR I YEAR I SEM / Faculty Development Program
TUESDAY	26th APR 2022	SECOND MID TERM EXAM FOR I YEAR I SEM / Faculty Development Program
WEDNESDAY	27th APR 2022	SECOND MID TERM EXAM FOR I YEAR I SEM / Faculty Development Program
THURSDAY	28th APR 2022	SECOND MID TERM EXAM FOR I YEAR I SEM / Faculty Development Program
FRIDAY	29th APR 2022	SECOND MID TERM EXAM FOR I YEAR I SEM / Faculty Development Program
SATURDAY	30th APR 2022	SECOND MID TERM EXAM FOR I YEAR I SEM / Faculty Development Program
SUNDAY	1st MAY 2022	SUNDAY
MONDAY	2nd MAY 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - I SEM
TUESDAY	3rd MAY 2022	RAMZAN
WEDNESDAY	4th MAY 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - I SEM
THURSDAY	5th MAY 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - I SEM
FRIDAY	6th MAY 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - I SEM
SATURDAY	7th MAY 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - I SEM / SUBMISSION OF SECOND TERM EXAM MARKS TO UNIVERSITY OF I YEAR I SEM
SUNDAY	8th MAY 2022	SUNDAY
MONDAY	9th MAY 2022	END SEMESTER EXAM FOR I YEAR I SEM / SUMMER VACATION FOR II, III, IV YEAR II SEM /
TUESDAY	10th MAY 2022	END SEMESTER EXAM FOR I YEAR I SEM / SUMMER VACATION FOR II, III, IV YEAR II SEM /
WEDNESDAY	11th MAY 2022	END SEMESTER EXAM FOR I YEAR I SEM / SUMMER VACATION FOR II, III, IV YEAR II SEM /
THURSDAY	12th MAY 2022	END SEMESTER EXAM FOR I YEAR I SEM / SUMMER VACATION FOR II, III, IV YEAR II SEM /
FRIDAY	13th MAY 2022	END SEMESTER EXAM FOR I YEAR I SEM / SUMMER VACATION FOR II, III, IV YEAR II SEM /
SATURDAY	14th MAY 2022	END SEMESTER EXAM FOR I YEAR I SEM / SUMMER VACATION FOR II, III, IV YEAR II SEM /
SUNDAY	15th MAY 2022	SUNDAY
MONDAY	16th MAY 2022	END SEMESTER EXAM FOR I YEAR I SEM / SUMMER VACATION FOR II, III, IV YEAR II SEM
TUESDAY	17th MAY 2022	END SEMESTER EXAM FOR I YEAR I SEM / SUMMER VACATION FOR II, III, IV YEAR II SEM
WEDNESDAY	18th MAY 2022	END SEMESTER EXAM FOR I YEAR I SEM / SUMMER VACATION FOR II, III, IV YEAR II SEM

THURSDAY	19th MAY 2022	END SEMESTER EXAM FOR I YEAR I SEM / SUMMER VACATION FOR II, III, IV YEAR II SEM
FRIDAY	20th MAY 2022	END SEMESTER EXAM FOR I YEAR I SEM / SUMMER VACATION FOR II, III, IV YEAR II SEM
SATURDAY	21st MAY 2022	END SEMESTER EXAM FOR I YEAR I SEM / SUMMER VACATION FOR II, III, IV YEAR II SEM
SUNDAY	22nd MAY 2022	SUNDAY
MONDAY	23rd MAY 2022	COMMENNCEMENT OF CLASSWORK FOR I YEAR II SEM
TUESDAY	24th MAY 2022	I SPELL OF INSTRUCTION I YEAR II SEM STARTING
WEDNESDAY	25th MAY 2022	CLASS WORK ACTIVITY
THURSDAY	26th MAY 2022	CLASS WORK ACTIVITY
FRIDAY	27th MAY 2022	CLASS WORK ACTIVITY
SATURDAY	28th MAY 2022	CLASS WORK ACTIVITY
SUNDAY	29th MAY 2022	SUNDAY
MONDAY	30th MAY 2022	FIRST MID TERM EXAM FOR II YEAR II SEM
TUESDAY	31st MAY 2022	FIRST MID TERM EXAM FOR II YEAR II SEM
WEDNESDAY	1st JUN 2022	FIRST MID TERM EXAM FOR II YEAR II SEM
THURSDAY	2nd JUN 2022	FIRST MID TERM EXAM FOR II YEAR II SEM
FRIDAY	3rd JUN 2022	FIRST MID TERM EXAM FOR II YEAR II SEM
SATURDAY	4th JUN 2022	I SPELL OF INSTRUCTION FOR II YEAR II SEM ENDING / FIRST MID TERM EXAM FOR II YEAR II SEM
SUNDAY	5th JUN 2022	SUNDAY
MONDAY	6th JUN 2022	II SPELL OF INSTRUCTION FOR II YEAR II SEM STARTING
TUESDAY	7th JUN 2022	CLASS WORK ACTIVITY
WEDNESDAY	8th JUN 2022	CLASS WORK ACTIVITY
THURSDAY	9th JUN 2022	CLASS WORK ACTIVITY
FRIDAY	10th JUN 2022	CLASS WORK ACTIVITY
SATURDAY	11th JUN 2022	CLASS WORK ACTIVITY / SUBMISSION OF FIRST MID TERM EXAM MARKS FOR II YEAR -II SEM TO UNIVERSITY
SUNDAY	12th JUN 2022	SUNDAY
MONDAY	13th JUN 2022	CLASS WORK ACTIVITY
TUESDAY	14th JUN 2022	CLASS WORK ACTIVITY
WEDNESDAY	15th JUN 2022	CLASS WORK ACTIVITY
THURSDAY	16th JUN 2022	CLASS WORK ACTIVITY
FRIDAY	17th JUN 2022	CLASS WORK ACTIVITY
SATURDAY	18th JUN 2022	CLASS WORK ACTIVITY
SUNDAY	19th JUN 2022	SUNDAY
MONDAY	20th JUN 2022	CLASS WORK ACTIVITY
TUESDAY	21st JUN 2022	CLASS WORK ACTIVITY
WEDNESDAY	22nd JUN 2022	CLASS WORK ACTIVITY
THURSDAY	23rd JUN 2022	CLASS WORK ACTIVITY
FRIDAY	24th JUN 2022	CLASS WORK ACTIVITY / II SPELL III, IV YEAR II SEM ENDING
SATURDAY	25th JUN 2022	SECOND MID TERM EXAM FOR III, IV YEAR II SEM
SUNDAY	26th JUN 2022	SUNDAY
MONDAY	27th JUN 2022	SECOND MID TERM EXAM FOR III, IV YEAR II SEM
TUESDAY	28th JUN 2022	SECOND MID TERM EXAM FOR III, IV YEAR II SEM
WEDNESDAY	29th JUN 2022	SECOND MID TERM EXAM FOR III, IV YEAR II SEM
THURSDAY	30th JUN 2022	SECOND MID TERM EXAM FOR III, IV YEAR II SEM
FRIDAY	1st JULY 2022	SECOND MID TERM EXAM FOR III, IV YEAR II SEM
SATURDAY	2nd JULY 2022	PREPARATION HOLIDAYS & PRACTICAL EXAM FOR III, IV YEAR II SEM
SUNDAY	3rd JULY 2022	SUNDAY
MONDAY	4th JULY 2022	PREPARATION HOLIDAYS & PRACTICAL EXAM FOR III, IV YEAR II SEM
TUESDAY	5th JULY 2022	PREPARATION HOLIDAYS & PRACTICAL EXAM FOR III, IV YEAR II SEM
WEDNESDAY	6th JULY 2022	PREPARATION HOLIDAYS & PRACTICAL EXAM FOR III, IV YEAR II SEM
THURSDAY	7th JULY 2022	PREPARATION HOLIDAYS & PRACTICAL EXAM FOR III, IV YEAR II SEM
FRIDAY	8th JULY 2022	PREPARATION HOLIDAYS & PRACTICAL EXAM FOR III, IV YEAR II SEM
SATURDAY	9th JULY 2022	PREPARATION HOLIDAYS & PRACTICAL EXAM FOR III, IV YEAR II SEM / SUBMISSION OF SECOND MID TERM EXAM MARKS TO UNIVERSITY III , IV YEAR II SEM
SUNDAY	10th JULY 2022	SUNDAY
MONDAY	11th JULY 2022	END SEMESTER EXAM FOR III , IV YEAR -II SEM

TUESDAY	12th JULY 2022	END SEMESTER EXAM FOR III , IV YEAR -II SEM
WEDNESDAY	13th JULY 2022	END SEMESTER EXAM FOR III , IV YEAR -II SEM
THURSDAY	14th JULY 2022	END SEMESTER EXAM FOR III , IV YEAR -II SEM
FRIDAY	15th JULY 2022	END SEMESTER EXAM FOR III , IV YEAR -II SEM
SATURDAY	16th JULY 2022	I SPELL OF INSTRUCTION ENDING / END SEMESTER EXAM FOR III , IV YEAR -II SEM
SUNDAY	17th JULY 2022	SUNDAY
MONDAY	18th JULY 2022	FIRST MID TERM EXAM FOR I YEAR II SEM / END SEMESTER EXAM FOR III , IV YEAR -II SEM
TUESDAY	19th JULY 2022	FIRST MID TERM EXAM FOR I YEAR II SEM / END SEMESTER EXAM FOR III , IV YEAR -II SEM
WEDNESDAY	20th JULY 2022	FIRST MID TERM EXAM FOR I YEAR II SEM / END SEMESTER EXAM FOR III , IV YEAR -II SEM
THURSDAY	21st JULY 2022	FIRST MID TERM EXAM FOR I YEAR II SEM / END SEMESTER EXAM FOR III , IV YEAR -II SEM
FRIDAY	22nd JULY 2022	FIRST MID TERM EXAM FOR I YEAR II SEM / END SEMESTER EXAM FOR III , IV YEAR -II SEM
SATURDAY	23rd JULY 2022	FIRST MID TERM EXAM FOR I YEAR II SEM / END SEMESTER EXAM FOR III , IV YEAR -II SEM
SUNDAY	24th JULY 2022	SUNDAY
MONDAY	25th JULY 2022	CLASS WORK ACTIVITY
TUESDAY	26th JULY 2022	II SPELL OF INSTRUCTION STARTING / CLASS WORK ACTIVITY
WEDNESDAY	27th JULY 2022	CLASS WORK ACTIVITY
THURSDAY	28th JULY 2022	CLASS WORK ACTIVITY
FRIDAY	29th JULY 2022	CLASS WORK ACTIVITY
SATURDAY	30th JULY 2022	CLASS WORK ACTIVITY / SUBMISSION OF FIRST MID TERM EXAM MARKS TO UNIVERSITY I YEAR II SEM / II SPELL OF INSTRUCTION FOR II YEAR II SEM ENDING
SUNDAY	31st JULY 2022	SUNDAY
MONDAY	1st AUG 2022	SECOND MID TERM EXAM FOR II YEAR II SEM
TUESDAY	2nd AUG 2022	SECOND MID TERM EXAM FOR II YEAR II SEM
WEDNESDAY	3rd AUG 2022	SECOND MID TERM EXAM FOR II YEAR II SEM
THURSDAY	4th AUG 2022	SECOND MID TERM EXAM FOR II YEAR II SEM
FRIDAY	5th AUG 2022	SECOND MID TERM EXAM FOR II YEAR II SEM
SATURDAY	6th AUG 2022	SECOND MID TERM EXAM FOR II YEAR II SEM
SUNDAY	7th AUG 2022	SUNDAY
MONDAY	8th AUG 2022	CLASS WORK ACTIVITY
TUESDAY	9th AUG 2022	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II YEAR II SEM
WEDNESDAY	10th AUG 2022	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II YEAR II SEM
THURSDAY	11th AUG 2022	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II YEAR II SEM
FRIDAY	12th AUG 2022	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II YEAR II SEM
SATURDAY	13th AUG 2022	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II YEAR II SEM
SUNDAY	14th AUG 2022	SUNDAY
MONDAY	15th AUG 2022	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II YEAR II SEM
TUESDAY	16th AUG 2022	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II YEAR II SEM / SUBMISSION OF SECOND MID TERM EXAM MARK FOR II YEAR II SEM
WEDNESDAY	17th AUG 2022	END SEMESTER EXAM FOR II YEAR II SEM
THURSDAY	18th AUG 2022	END SEMESTER EXAM FOR II YEAR II SEM
FRIDAY	19th AUG 2022	END SEMESTER EXAM FOR II YEAR II SEM
SATURDAY	20th AUG 2022	END SEMESTER EXAM FOR II YEAR II SEM
SUNDAY	21st AUG 2022	SUNDAY
MONDAY	22nd AUG 2022	END SEMESTER EXAM FOR II YEAR II SEM
TUESDAY	23rd AUG 2022	END SEMESTER EXAM FOR II YEAR II SEM
WEDNESDAY	24th AUG 2022	END SEMESTER EXAM FOR II YEAR II SEM
THURSDAY	25th AUG 2022	END SEMESTER EXAM FOR II YEAR II SEM
FRIDAY	26th AUG 2022	END SEMESTER EXAM FOR II YEAR II SEM
SATURDAY	27th AUG 2022	END SEMESTER EXAM FOR II YEAR II SEM
SUNDAY	28th AUG 2022	SUNDAY
MONDAY	29th AUG 2022	END SEMESTER EXAM FOR II YEAR II SEM
TUESDAY	30th AUG 2022	END SEMESTER EXAM FOR II YEAR II SEM
WEDNESDAY	31th AUG 2022	GANESH CHATURTHI
THURSDAY	1st SEP 2022	CLASS WORK ACTIVITY

FRIDAY	2nd SEP 2022	CLASS WORK ACTIVITY
SATURDAY	3rd SEP 2022	CLASS WORK ACTIVITY
SUNDAY	4th SEP 2022	SUNDAY
MONDAY	5th SEP 2022	CLASS WORK ACTIVITY
TUESDAY	6th SEP 2022	CLASS WORK ACTIVITY
WEDNESDAY	7th SEP 2022	CLASS WORK ACTIVITY
THURSDAY	8th SEP 2022	CLASS WORK ACTIVITY
FRIDAY	9th SEP 2022	CLASS WORK ACTIVITY
SATURDAY	10th SEP 2022	CLASS WORK ACTIVITY
SUNDAY	11th SEP 2022	SUNDAY
MONDAY	12th SEP 2022	CLASS WORK ACTIVITY
TUESDAY	13th SEP 2022	CLASS WORK ACTIVITY
WEDNESDAY	14th SEP 2022	CLASS WORK ACTIVITY
THURSDAY	15th SEP 2022	CLASS WORK ACTIVITY
FRIDAY	16th SEP 2022	CLASS WORK ACTIVITY
SATURDAY	17th SEP 2022	CLASS WORK ACTIVITY / II SPELL OF INSTRUCTION ENDING
SUNDAY	18th SEP 2022	SUNDAY (PHARMACIST DAY)
MONDAY	19th SEP 2022	SECOND MID TERM EXAM FOR I YEAR II SEM
TUESDAY	20th SEP 2022	SECOND MID TERM EXAM FOR I YEAR II SEM
WEDNESDAY	21st SEP 2022	SECOND MID TERM EXAM FOR I YEAR II SEM
THURSDAY	22nd SEP 2022	SECOND MID TERM EXAM FOR I YEAR II SEM
FRIDAY	23rd SEP 2022	SECOND MID TERM EXAM FOR I YEAR II SEM
SATURDAY	24th SEP 2022	SECOND MID TERM EXAM FOR I YEAR II SEM
SUNDAY	25th SEP 2022	SUNDAY
MONDAY	26th SEP 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR II SEM
TUESDAY	27th SEP 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR II SEM
WEDNESDAY	28th SEP 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR II SEM
THURSDAY	29th SEP 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR II SEM
FRIDAY	30th SEP 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR II SEM
SATURDAY	1st OCT 2022	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR II SEM /SUBMISSION OF SECOND MID TERM EXAM MARKS TO UNIVERSITY I YEAR II SEM
SUNDAY	2nd OCT 2022	SUNDAY
MONDAY	3rd OCT 2022	END SEMESTER EXAM FOR I YEAR II SEM
TUESDAY	4th OCT 2022	END SEMESTER EXAM FOR I YEAR II SEM
WEDNESDAY	5th OCT 2022	END SEMESTER EXAM FOR I YEAR II SEM
THURSDAY	6th OCT 2022	END SEMESTER EXAM FOR I YEAR II SEM
FRIDAY	7th OCT 2022	END SEMESTER EXAM FOR I YEAR II SEM
SATURDAY	8th OCT 2022	END SEMESTER EXAM FOR I YEAR II SEM
SUNDAY	9th OCT 2022	SUNDAY
MONDAY	10th OCT 2022	END SEMESTER EXAM FOR I YEAR II SEM
TUESDAY	11th OCT 2022	END SEMESTER EXAM FOR I YEAR II SEM
WEDNESDAY	12th OCT 2022	END SEMESTER EXAM FOR I YEAR II SEM
THURSDAY	13th OCT 2022	END SEMESTER EXAM FOR I YEAR II SEM
FRIDAY	14th OCT 2022	END SEMESTER EXAM FOR I YEAR II SEM
SATURDAY	15th OCT 2022	END SEMESTER EXAM FOR I YEAR II SEM
SUNDAY	16th OCT 2022	SUNDAY
MONDAY	17th OCT 2022	END SEMESTER EXAM FOR I YEAR II SEM
TUESDAY	18th OCT 2022	END SEMESTER EXAM FOR I YEAR II SEM

PRINCETON COLLEGE OF PHARMACY

Vijayapuri colony Chowdaryguda (V), Ghatkesar (M), Medchal (D), TS-500088

(Affiliated to JNTUH, Hyderabad & Approved by AICTE,PCI, New Delhi)

COLLEGE ACADEMIC CALENDER FOR THE ACADEMIC YEAR 2020-21

	MONDAY	24th AUG 2020	COMMENCEMENT OF II, III, IV YEAR -I SEM
	TUESDAY	25th AUG 2020	I SPELL OF INSTRUCTIONS II, III, IV YEAR - I SEM STARTING DAY
	WEDNESDAY	26th AUG 2020	
	THURSDAY	27th AUG 2020	CLASS WORK ACTIVITY
	FRIDAY	28th AUG 2020	CLASS WORK ACTIVITY
	SATURDAY	29th AUG 2020	CLASS WORK ACTIVITY
	SUNDAY	30th AUG 2020	SUNDAY
	MONDAY	31th AUG 2020	CLASS WORK ACTIVITY
	TUESDAY	1st SEP 2020	CLASS WORK ACTIVITY
	WEDNESDAY	2nd SEP 2020	CLASS WORK ACTIVITY
	THURSDAY	3rd SEP 2020	CLASS WORK ACTIVITY
	FRIDAY	4th SEP 2020	CLASS WORK ACTIVITY
	SATURDAY	5th SEP 2020	TEACHERS DAY / CLASS WORK ACTIVITY
	SUNDAY	6th SEP 2020	SUNDAY
	MONDAY	7th SEP 2020	CLASS WORK ACTIVITY
	TUESDAY	8th SEP 2020	CLASS WORK ACTIVITY
	WEDNESDAY	9th SEP 2020	CLASS WORK ACTIVITY
	THURSDAY	10th SEP 2020	CLASS WORK ACTIVITY
	FRIDAY	11th SEP 2020	CLASS WORK ACTIVITY
	SATURDAY	12th SEP 2020	SECOND SATURDAY
	SUNDAY	13th SEP 2020	SUNDAY
	MONDAY	14th SEP 2020	CLASS WORK ACTIVITY
	TUESDAY	15th SEP 2020	ENGINEER'S DAY / CLASS WORK ACTIVITY
	WEDNESDAY	16th SEP 2020	CLASS WORK ACTIVITY
	THURSDAY	17th SEP 2020	CLASS WORK ACTIVITY
	FRIDAY	18th SEP 2020	CLASS WORK ACTIVITY
	SATURDAY	19th SEP 2020	CLASS WORK ACTIVITY
	SUNDAY	20th SEP 2020	SUNDAY
	MONDAY	21th SEP 2020	CLASS WORK ACTIVITY
	TUESDAY	22th SEP 2020	CLASS WORK ACTIVITY
	WEDNESDAY	23th SEP 2020	CLASS WORK ACTIVITY
	THURSDAY	24th SEP 2020	CLASS WORK ACTIVITY
	FRIDAY	25th SEP 2020	BATHUKAMMA CELEBRATION/PHARMACIST DAY
	SATURDAY	26th SEP 2020	CLASS WORK ACTIVITY
	SUNDAY	27th SEP 2020	SUNDAY
	MONDAY	28th SEP 2020	One day seminar
	TUESDAY	29th SEP 2020	CLASS WORK ACTIVITY
	WEDNESDAY	30th SEP 2020	CLASS WORK ACTIVITY
	THURSDAY	1st OCT 2020	CLASS WORK ACTIVITY
	FRIDAY	2nd OCT 2020	CLASS WORK ACTIVITY
	SATURDAY	3rd OCT 2020	CLASS WORK ACTIVITY
	SUNDAY	4th OCT 2020	SUNDAY
	MONDAY	5th OCT 2020	CLASS WORK ACTIVITY
	TUESDAY	6th OCT 2020	CLASS WORK ACTIVITY
	WEDNESDAY	7th OCT 2020	CLASS WORK ACTIVITY
	THURSDAY	8th OCT 2020	CLASS WORK ACTIVITY
	FRIDAY	9th OCT 2020	CLASS WORK ACTIVITY
	SATURDAY	10th OCT 2020	SECOND SATURDAY
	SUNDAY	11th OCT 2020	SUNDAY
	MONDAY	12th OCT 2020	CLASS WORK ACTIVITY
	TUESDAY	13th OCT 2020	CLASS WORK ACTIVITY

	WEDNESDAY	14th OCT 2020	CLASS WORK ACTIVITY
	THURSDAY	15th OCT 2020	CLASS WORK ACTIVITY
	FRIDAY	16th OCT 2020	CLASS WORK ACTIVITY
	SATURDAY	17th OCT 2020	I SPELL INSTRUCTION FOR II, III, IV YEAR - ISEM ENDNG/ AWARENESS SESSION ON CODE OF ETHICS PROFESSIONAL CONDUCT
	SUNDAY	18th OCT 2020	SUNDAY
	MONDAY	19th OCT 2020	DUSSEHRA RECESS II,III,IV YEAR I SEM
	TUESDAY	20th OCT 2020	DUSSEHRA RECESS II,III,IV YEAR I SEM
	WEDNESDAY	21th OCT 2020	DUSSEHRA RECESS II,III,IV YEAR I SEM
	THURSDAY	22th OCT 2020	DUSSEHRA RECESS II,III,IV YEAR I SEM
	FRIDAY	23th OCT 2020	DUSSEHRA RECESS II,III,IV YEAR I SEM
	SATURDAY	24th OCT 2020	DUSSEHRA RECESS II,III,IV YEAR I SEM
	SUNDAY	25th OCT 2020	SUNDAY
	MONDAY	26th OCT 2020	FIRST MID TERM EXAMS FOR II,III, IV - I SEM / AWARENESS SESSION ON NATIONAL CONSTITUTION DAY
	TUESDAY	27th OCT 2020	FIRST MID TERM EXAMS FOR II,III, IV - I SEM
	WEDNESDAY	28th OCT 2020	FIRST MID TERM EXAMS FOR II,III, IV - I SEM
	THURSDAY	29th OCT 2020	FIRST MID TERM EXAMS FOR II,III, IV - I SEM
	FRIDAY	30th OCT 2020	FIRST MID TERM EXAMS FOR II,III, IV - I SEM
	SATURDAY	31th OCT 2020	FIRST MID TERM EXAMS FOR II,III, IV - I SEM
	SUNDAY	1st NOV 2020	SUNDAY
	MONDAY	2nd NOV 2020	II SPELL INSTRUCTION FOR II, III, IV YEAR - ISEM STARTING
	TUESDAY	3rd NOV 2020	CLASS WORK ACTIVITY
	WEDNESDAY	4th NOV 2020	CLASS WORK ACTIVITY
	THURSDAY	5th NOV 2020	CLASS WORK ACTIVITY
	FRIDAY	6th NOV 2020	CLASS WORK ACTIVITY
	SATURDAY	7th NOV 2020	CLASS WORK ACTIVITY / SUBMISSION OF FIRST MID TERM EXAM FOR II,III, IV YEAR - I SEM
	SUNDAY	8th NOV 2020	SUNDAY
	MONDAY	9th NOV 2020	LEGAL SERVICE DAY / CLASS WORK ACTIVITY
	TUESDAY	10th NOV 2020	CLASS WORK ACTIVITY
	WEDNESDAY	11th NOV 2020	CLASS WORK ACTIVITY
	THURSDAY	12th NOV 2020	CLASS WORK ACTIVITY
	FRIDAY	13th NOV 2020	PARENT TEACHER MEETING FOR II,III,IV YEAR - I SEM
	SATURDAY	14th NOV 2020	SECOND SATURDAY
	SUNDAY	15th NOV 2020	SUNDAY
	MONDAY	16th NOV 2020	CLASS WORK ACTIVITY
	TUESDAY	17th NOV 2020	CLASS WORK ACTIVITY
	WEDNESDAY	18th NOV 2020	CLASS WORK ACTIVITY
	THURSDAY	19th NOV 2020	CLASS WORK ACTIVITY
	FRIDAY	20th NOV 2020	CLASS WORK ACTIVITY
	SATURDAY	21th NOV 2020	CLASS WORK ACTIVITY
	SUNDAY	22th NOV 2020	SUNDAY / Guest lecture on opportunity of Internship for B.PHARM & M.PHARM students
	MONDAY	23th NOV 2020	CLASS WORK ACTIVITY
	TUESDAY	24th NOV 2020	CLASS WORK ACTIVITY
	WEDNESDAY	25th NOV 2020	CLASS WORK ACTIVITY
	THURSDAY	26th NOV 2020	AWARENESS SESSION ON NATIONAL CONSTITUTION DAY
	FRIDAY	27th NOV 2020	CLASS WORK ACTIVITY
	SATURDAY	28th NOV 2020	CLASS WORK ACTIVITY
	SUNDAY	29th NOV 2020	SUNDAY
	MONDAY	30th NOV 2020	CLASS WORK ACTIVITY
	TUESDAY	1st DEC 2020	COMMENCEMENT OF I YEAR -I SEM
	WEDNESDAY	2nd DEC 2020	I SPELL OF INSTRUCTIONS I YEAR - I SEM STARTING DAY
	THURSDAY	3rd DEC 2020	CLASS WORK ACTIVITY
	FRIDAY	4th DEC 2020	Webinar
	SATURDAY	5th DEC 2020	CLASS WORK ACTIVITY
	SUNDAY	6th DEC 2020	SUNDAY

	MONDAY	7th DEC 2020	CLASS WORK ACTIVITY
	TUESDAY	8th DEC 2020	CLASS WORK ACTIVITY
	WEDNESDAY	9th DEC 2020	Seminar
	THURSDAY	10th DEC 2020	CLASS WORK ACTIVITY
	FRIDAY	11th DEC 2020	CLASS WORK ACTIVITY
	SATURDAY	12th DEC 2020	SECOND SATURDAY /
	SUNDAY	13th DEC 2020	SUNDAY
	MONDAY	14th DEC 2020	CLASS WORK ACTIVITY
	TUESDAY	15th DEC 2020	CLASS WORK ACTIVITY
	WEDNESDAY	16th DEC 2020	CLASS WORK ACTIVITY
	THURSDAY	17th DEC 2020	CLASS WORK ACTIVITY
	FRIDAY	18th DEC 2020	CLASS WORK ACTIVITY
	SATURDAY	19th DEC 2020	CLASS WORK ACTIVITY
	SUNDAY	20th DEC 2020	SUNDAY
	MONDAY	21th DEC 2020	CLASS WORK ACTIVITY
	TUESDAY	22th DEC 2020	CLASS WORK ACTIVITY
	WEDNESDAY	23th DEC 2020	CLASS WORK ACTIVITY
	THURSDAY	24th DEC 2020	CLASS WORK ACTIVITY
	FRIDAY	25th DEC 2020	CLASS WORK ACTIVITY
	SATURDAY	26th DEC 2020	II SPELL INSTRUCTION FOR II, III, IV YEAR - ISEM ENDING
	SUNDAY	27th DEC 2020	SUNDAY
	MONDAY	28th DEC 2020	SECOND MID TERM EXAM FOR II,III,IV YEAR I SEM
	TUESDAY	29th DEC 2020	SECOND MID TERM EXAM FOR II,III,IV YEAR I SEM
	WEDNESDAY	30th DEC 2020	SECOND MID TERM EXAM FOR II,III,IV YEAR I SEM
	THURSDAY	31th DEC 2020	SECOND MID TERM EXAM FOR II,III,IV YEAR I SEM
	FRIDAY	1st JAN 2021	SECOND MID TERM EXAM FOR II,III,IV YEAR I SEM
	SATURDAY	2nd JAN 2021	SECOND MID TERM EXAM FOR II,III,IV YEAR I SEM
	SUNDAY	3rd JAN 2021	SUNDAY
	MONDAY	4th JAN 2021	PREPARATION HOLIDAY & PRACTICAL EXAM FOR II,III,IV YEAR -I SEM
	TUESDAY	5th JAN 2021	PREPARATION HOLIDAY & PRACTICAL EXAM FOR II,III,IV YEAR -I SEM
	WEDNESDAY	6th JAN 2021	PREPARATION HOLIDAY & PRACTICAL EXAM FOR II,III,IV YEAR -I SEM
	THURSDAY	7th JAN 2021	PREPARATION HOLIDAY & PRACTICAL EXAM FOR II,III,IV YEAR -I SEM
	FRIDAY	8th JAN 2021	PREPARATION HOLIDAY & PRACTICAL EXAM FOR II,III,IV YEAR -I SEM
	SATURDAY	9th JAN 2021	SECOND SATURDAY / PREPARATION HOLIDAY & PRACTICAL EXAM FOR II,III,IV YEAR - I SEM / SUBMISSION OF SECOND MID TERM EXAM MARKS TO UNIVERSITY II,III,IV YEAR - I SEM
	SUNDAY	10th JAN 2021	SUNDAY
	MONDAY	11th JAN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - I SEM
	TUESDAY	12th JAN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - I SEM / NATIONAL YOUTH DAY
	WEDNESDAY	13th JAN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - I SEM
	THURSDAY	14th JAN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - I SEM
	FRIDAY	15th JAN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - I SEM
	SATURDAY	16th JAN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - I SEM
	SUNDAY	17th JAN 2021	SUNDAY
	MONDAY	18th JAN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - I SEM
	TUESDAY	19th JAN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - I SEM
	WEDNESDAY	20th JAN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - I SEM
	THURSDAY	21th JAN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - I SEM
	FRIDAY	22thJAN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - I SEM
	SATURDAY	23th JAN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - I SEM /I SPELL INSTRUCTION FOR II, III, IV YEAR - ISEM ENDING
	SUNDAY	24th JAN 2021	SUNDAY

	MONDAY	25th JAN 2021	FIRST MID TERM EXAM FOR I YEAR I SEM / COMMENCEMENT OF II, III, IV YEAR -II SEM
	TUESDAY	26th JAN 2021	FIRST MID TERM EXAM FOR I YEAR I SEM/ I SPELL INSTRUCTION FOR II, III, IV YEAR - ISEM STARTING / REPUBLIC DAY
	WEDNESDAY	27th JAN 2021	FIRST MID TERM EXAM FOR I YEAR I SEM
	THURSDAY	28th JAN 2021	FIRST MID TERM EXAM FOR I YEAR I SEM
	FRIDAY	29th JAN 2021	FIRST MID TERM EXAM FOR I YEAR I SEM
	SATURDAY	30th JAN 2021	FIRST MID TERM EXAM FOR I YEAR I SEM
	SUNDAY	31th JAN 2021	SUNDAY
	MONDAY	1st FEB 2021	II SPELL INSTRUCTION FOR I YEAR - ISEM STARTING / Webinar on paper waste, Metal waste, Plastic waste & E-waste generated in its college
	TUESDAY	2nd FEB 2021	CLASS WORK ACTIVITY
	WEDNESDAY	3rd FEB 2021	CLASS WORK ACTIVITY
	THURSDAY	4th FEB 2021	CLASS WORK ACTIVITY
	FRIDAY	5th FEB 2021	CLASS WORK ACTIVITY
	SATURDAY	6th FEB 2021	SUBMISSION OF SECOND MID TERM EXAM MARKS TO UNIVERSITY I YEAR - I SEM
	SUNDAY	7th FEB 2021	SUNDAY
	MONDAY	8th FEB 2021	CLASS WORK ACTIVITY
	TUESDAY	9th FEB 2021	CLASS WORK ACTIVITY
	WEDNESDAY	10th FEB 2021	CLASS WORK ACTIVITY
	THURSDAY	11th FEB 2021	CLASS WORK ACTIVITY
	FRIDAY	12th FEB 2021	PARENT TEACHER MEETING FOR I YEAR - I SEM /
	SATURDAY	13th FEB 2021	SECOND SATURDAY / Online VLSI TRAINING
	SUNDAY	14th FEB 2021	SUNDAY
	MONDAY	15th FEB 2021	Online ---------- TRAINING
	TUESDAY	16th FEB 2021	Online ----------TRAINING
	WEDNESDAY	17th FEB 2021	Online ---------- TRAINING
	THURSDAY	18th FEB 2021	CLASS WORK ACTIVITY
	FRIDAY	19th FEB 2021	CLASS WORK ACTIVITY
	SATURDAY	20th FEB 2021	CLASS WORK ACTIVITY
	SUNDAY	21th FEB 2021	SUNDAY
	MONDAY	22th FEB 2021	CLASS WORK ACTIVITY
	TUESDAY	23th FEB 2021	CLASS WORK ACTIVITY
	WEDNESDAY	24th FEB 2021	CLASS WORK ACTIVITY
	THURSDAY	25th FEB 2021	CLASS WORK ACTIVITY
	FRIDAY	26th FEB 2021	CLASS WORK ACTIVITY
	SATURDAY	27th FEB 2021	CLASS WORK ACTIVITY
	SUNDAY	28th FEB 2021	SUNDAY
	MONDAY	1st MAR 2021	CLASS WORK ACTIVITY
	TUESDAY	2nd MAR 2021	CLASS WORK ACTIVITY
	WEDNESDAY	3rd MAR 2021	CLASS WORK ACTIVITY
	THURSDAY	4th MAR 2021	CLASS WORK ACTIVITY
	FRIDAY	5th MAR 2021	CLASS WORK ACTIVITY
	SATURDAY	6th MAR 2021	CLASS WORK ACTIVITY
	SUNDAY	7th MAR 2021	SUNDAY
	MONDAY	8th MAR 2021	INTERNATIONAL WOMEN'S DAY
	TUESDAY	9th MAR 2021	CLASS WORK ACTIVITY
	WEDNESDAY	10th MAR 2021	CLASS WORK ACTIVITY
	THURSDAY	11th MAR 2021	CLASS WORK ACTIVITY
	FRIDAY	12th MAR 2021	CLASS WORK ACTIVITY
	SATURDAY	13th MAR 2021	SECOND SATURDAY
	SUNDAY	14th MAR 2021	SUNDAY
	MONDAY	15th MAR 2021	CLASS WORK ACTIVITY
	TUESDAY	16th MAR 2021	CLASS WORK ACTIVITY
	WEDNESDAY	17th MAR 2021	CLASS WORK ACTIVITY
	THURSDAY	18th MAR 2021	CLASS WORK ACTIVITY

	FRIDAY	19th MAR 2021	CLASS WORK ACTIVITY
	SATURDAY	20th MAR 2021	I SPELL INSTRUCTION FOR II, III, IV YEAR -IISEM ENDING
	SUNDAY	21th MAR 2021	SUNDAY
	MONDAY	22th MAR 2021	FIRST MID EXAM FOR II,III,IV YEAR - II SEM
	TUESDAY	23th MAR 2021	FIRST MID EXAM FOR II,III,IV YEAR - II SEM
	WEDNESDAY	24th MAR 2021	FIRST MID EXAM FOR II,III,IV YEAR - II SEM
	THURSDAY	25th MAR 2021	FIRST MID EXAM FOR II,III,IV YEAR - II SEM
	FRIDAY	26th MAR 2021	FIRST MID EXAM FOR II,III,IV YEAR - II SEM
	SATURDAY	27th MAR 2021	FIRST MID EXAM FOR II,III,IV YEAR - II SEM / II SPELL INSTRUCTION FOR I YEAR - ISEM ENDING
	SUNDAY	28th MAR 2021	SUNDAY
	MONDAY	29th MAR 2021	SECOND MID TERM EXAM FOR I YEAR I SEM/ II SPELL INSTRUCTION FOR II, III, IV YEAR -IISEM STARTING
	TUESDAY	30th MAR 2021	SECOND MID TERM EXAM FOR I YEAR I SEM
	WEDNESDAY	31th MAR 2021	SECOND MID TERM EXAM FOR I YEAR I SEM
	THURSDAY	1st APR 2021	SECOND MID TERM EXAM FOR I YEAR I SEM
	FRIDAY	2nd APR 2021	SECOND MID TERM EXAM FOR I YEAR I SEM
	SATURDAY	3rd APR 2021	SECOND MID TERM EXAM FOR I YEAR I SEM
	SUNDAY	4th APR 2021	SUNDAY
	MONDAY	5th APR 2021	SECOND MID TERM EXAM FOR I YEAR I SEM
	TUESDAY	6th APR 2021	SECOND MID TERM EXAM FOR I YEAR I SEM / SUBMISSION OF FIRST MID TERM EXAM FOR II,III, IV YEAR - II SEM
	WEDNESDAY	7th APR 2021	PREPARATION HOLIDAYS & PRACTICAL EXAM FOR I YEAR I SEM / Guest lecture on Promote Collaboration between PCOP & board in mutually beneficial areas like Training & Placements.
	THURSDAY	8th APR 2021	PREPARATION HOLIDAYS & PRACTICAL EXAM FOR I YEAR I SEM
	FRIDAY	9th APR 2021	PREPARATION HOLIDAYS & PRACTICAL EXAM FOR I YEAR I SEM / PARENT TEACHER MEETING FOR II,III,IV YEAR - II SEM
	SATURDAY	10th APR 2021	SECOND SATURDAY
	SUNDAY	11th APR 2021	SUNDAY
	MONDAY	12th APR 2021	PREPARATION HOLIDAYS & PRACTICAL EXAM FOR I YEAR I SEM / SUBMISSION OF FIRST MID TERM EXAM FOR I YEAR - I SEM
	TUESDAY	13th APR 2021	CLASS WORK ACTIVITY
	WEDNESDAY	14th APR 2021	CLASS WORK ACTIVITY
	THURSDAY	15th APR 2021	END SEMESTER EXAM FOR I YEAR I SEM
	FRIDAY	16th APR 2021	END SEMESTER EXAM FOR I YEAR I SEM
	SATURDAY	17th APR2021	END SEMESTER EXAM FOR I YEAR I SEM
	SUNDAY	18th APR 2021	SUNDAY
	MONDAY	19th APR 2021	END SEMESTER EXAM FOR I YEAR I SEM
	TUESDAY	20th APR 2021	END SEMESTER EXAM FOR I YEAR I SEM
	WEDNESDAY	21th APR 2021	END SEMESTER EXAM FOR I YEAR I SEM
	THURSDAY	22th APR 2021	END SEMESTER EXAM FOR I YEAR I SEM
	FRIDAY	23th APR 2021	END SEMESTER EXAM FOR I YEAR I SEM
	SATURDAY	24th APR 2021	END SEMESTER EXAM FOR I YEAR I SEM
	SUNDAY	25th APR 2021	SUNDAY
	MONDAY	26th APR 2021	END SEMESTER EXAM FOR I YEAR I SEM
	TUESDAY	27th APR 2021	END SEMESTER EXAM FOR I YEAR I SEM
	WEDNESDAY	28th APR 2021	END SEMESTER EXAM FOR I YEAR I SEM
	THURSDAY	29th APR 2021	END SEMESTER EXAM FOR I YEAR I SEM
	FRIDAY	30th APR 2021	COMMENCEMENT OF I YEAR -II SEM
	SATURDAY	1st MAY 2021	I SPELL INSTRUCTION FOR I YEAR -IISEM STARTING
	SUNDAY	2nd MAY 2021	SUNDAY
	MONDAY	3rd MAY 2021	CLASS WORK ACTIVITY
	TUESDAY	4th MAY 2021	CLASS WORK ACTIVITY
	WEDNESDAY	5th MAY 2021	CLASS WORK ACTIVITY
	THURSDAY	6th MAY 2021	CLASS WORK ACTIVITY
	FRIDAY	7th MAY 2021	CLASS WORK ACTIVITY
	SATURDAY	8th MAY 2021	CLASS WORK ACTIVITY

	SUNDAY	9th MAY 2021	SUNDAY
	MONDAY	10th MAY 2021	CLASS WORK ACTIVITY
	TUESDAY	11th MAY 2021	CLASS WORK ACTIVITY
	WEDNESDAY	12th MAY 2021	CLASS WORK ACTIVITY
	THURSDAY	13th MAY 2021	CLASS WORK ACTIVITY
	FRIDAY	14th MAY 2021	CLASS WORK ACTIVITY
	SATURDAY	15th MAY 2021	SECOND SATURDAY
	SUNDAY	16th MAY 2021	SUNDAY
	MONDAY	17th MAY 2021	CLASS WORK ACTIVITY
	TUESDAY	18th MAY 2021	CLASS WORK ACTIVITY
	WEDNESDAY	19th MAY 2021	CLASS WORK ACTIVITY
	THURSDAY	20th MAY 2021	CLASS WORK ACTIVITY
	FRIDAY	21th MAY 2021	CLASS WORK ACTIVITY
	SATURDAY	22th MAY 2021	II SPELL INSTRUCTION FOR II, III, IV YEAR -IISEM ENDING
	SUNDAY	23th MAY 2021	SUNDAY
	MONDAY	24th MAY 2021	SECOND MID TERM EXAM FOR II,III,IV YEAR - II SEM
	TUESDAY	25th MAY 2021	SECOND MID TERM EXAM FOR II,III,IV YEAR - II SEM
	WEDNESDAY	26th MAY 2021	SECOND MID TERM EXAM FOR II,III,IV YEAR - II SEM
	THURSDAY	27th MAY 2021	SECOND MID TERM EXAM FOR II,III,IV YEAR - II SEM
	FRIDAY	28th MAY 2021	SECOND MID TERM EXAM FOR II,III,IV YEAR - II SEM
	SATURDAY	29th MAY 2021	SECOND MID TERM EXAM FOR II,III,IV YEAR - II SEM
	SUNDAY	30th MAY 2021	SUNDAY
	MONDAY	31th MAY 2021	PREPARATION HOLIDAY & PRACTICAL EXAM FOR II,III,IV YEAR -II SEM
	TUESDAY	1st JUN 2021	PREPARATION HOLIDAY & PRACTICAL EXAM FOR II,III,IV YEAR -II SEM
	WEDNESDAY	2nd JUN 2021	PREPARATION HOLIDAY & PRACTICAL EXAM FOR II,III,IV YEAR -II SEM
	THURSDAY	3rd JUN 2021	PREPARATION HOLIDAY & PRACTICAL EXAM FOR II,III,IV YEAR -II SEM
	FRIDAY	4th JUN 2021	PREPARATION HOLIDAY & PRACTICAL EXAM FOR II,III,IV YEAR -II SEM
	SATURDAY	5th JUN 2021	PREPARATION HOLIDAY & PRACTICAL EXAM FOR II,III,IV YEAR -II SEM / SUBMISSION OF FIRST MID TERM EXAM FOR II,III, IV YEAR - II SEM
	SUNDAY	6th JUN 2021	SUNDAY
	MONDAY	7th JUN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
	TUESDAY	8th JUN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
	WEDNESDAY	9th JUN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
	THURSDAY	10th JUN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
	FRIDAY	11th JUN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
	SATURDAY	12th JUN 2021	SECOND SATURDAY
	SUNDAY	13th JUN 2021	SUNDAY
	MONDAY	14th JUN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
	TUESDAY	15th JUN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
	WEDNESDAY	16th JUN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
	THURSDAY	17th JUN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
	FRIDAY	18th JUN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
	SATURDAY	19th JUN 2021	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
	SUNDAY	20th JUN 2021	SUNDAY
	MONDAY	21th JUN 2021	SUMMER VACATION / YOGA DAY
	TUESDAY	22thJUN 2021	SUMMER VACATION
	WEDNESDAY	23th JUN 2021	SUMMER VACATION
	THURSDAY	24th JUN 2021	SUMMER VACATION / I SPELL OF INSTRUCTION IYEAR I SEM ENDING
	FRIDAY	25th JUN 2021	SUMMER VACATION / FIRST MID TERM EXAM FOR I YEAR -II SEM
	SATURDAY	26th JUN 2021	SUMMER VACATION / FIRST MID TERM EXAM FOR I YEAR -II SEM

	SUNDAY	27th JUN 2021	SUNDAY
	MONDAY	28th JUN 2021	SUMMER VACATION / FIRST MID TERM EXAM FOR I YEAR -II SEM
	TUESDAY	29th JUN 2021	SUMMER VACATION / FIRST MID TERM EXAM FOR I YEAR -II SEM
	WEDNESDAY	30th JUN 2021	SUMMER VACATION / FIRST MID TERM EXAM FOR I YEAR -II SEM
	THURSDAY	1st JULY 2021	SUMMER VACATION / II SPELL OF INSTRUCTION I YEAR I SEM STARTING
	FRIDAY	2nd JULY 2021	SUMMER VACATION
	SATURDAY	3rd JULY 2021	SUMMER VACATION
	SUNDAY	4th JULY 2021	SUNDAY
	MONDAY	5th JULY 2021	SUMMER VACATION / SUBMISSION OF FIRST MID TERM EXAM FOR II,III, IV YEAR - II SEM
	TUESDAY	6th JULY 2021	SUMMER VACATION
	WEDNESDAY	7th JULY 2021	SUMMER VACATION
	THURSDAY	8th JULY 2021	SUMMER VACATION
	FRIDAY	9th JULY 2021	SUMMER VACATION / PARENT TEACHER MEETING I YEAR II SEM
	SATURDAY	10th JULY 2021	SECOND SATURDAY
	SUNDAY	11th JULY 2021	SUNDAY
	MONDAY	12th JULY 2021	CLASS WORK ACTIVITY
	TUESDAY	13th JULY 2021	CLASS WORK ACTIVITY
	WEDNESDAY	14th JULY 2021	CLASS WORK ACTIVITY
	THURSDAY	15th JULY 2021	CLASS WORK ACTIVITY
	FRIDAY	16th JULY 2021	CLASS WORK ACTIVITY
	SATURDAY	17th JULY 2021	CLASS WORK ACTIVITY
	SUNDAY	18th JULY 2021	SUNDAY
	MONDAY	19th JULY 2021	CLASS WORK ACTIVITY
	TUESDAY	20th JULY 2021	CLASS WORK ACTIVITY
	WEDNESDAY	21th JULY 2021	BAKRID
	THURSDAY	22th JULY 2021	CLASS WORK ACTIVITY
	FRIDAY	23th JULY 2021	CLASS WORK ACTIVITY
	SATURDAY	24th JULY 2021	CLASS WORK ACTIVITY
	SUNDAY	25th JULY 2021	SUNDAY
	MONDAY	26th JULY 2021	CLASS WORK ACTIVITY
	TUESDAY	27th JULY 2021	CLASS WORK ACTIVITY
	WEDNESDAY	28th JULY 2021	CLASS WORK ACTIVITY
	THURSDAY	29th JULY 2021	CLASS WORK ACTIVITY
	FRIDAY	30th JULY 2021	CLASS WORK ACTIVITY
	SATURDAY	31th JULY 2021	CLASS WORK ACTIVITY
	SUNDAY	1st AUG 2021	SUNDAY
	MONDAY	2nd AUG 2021	BONALU
	TUESDAY	3rd AUG 2021	CLASS WORK ACTIVITY
	WEDNESDAY	4th AUG 2021	CLASS WORK ACTIVITY
	THURSDAY	5th AUG 2021	CLASS WORK ACTIVITY
	FRIDAY	6th AUG 2021	CLASS WORK ACTIVITY
	SATURDAY	7th AUG 2021	CLASS WORK ACTIVITY
	SUNDAY	8th AUG 2021	SUNDAY
	MONDAY	9th AUG 2021	CLASS WORK ACTIVITY
	TUESDAY	10th AUG 2021	CLASS WORK ACTIVITY
	WEDNESDAY	11th AUG 2021	CLASS WORK ACTIVITY
	THURSDAY	12th AUG 2021	CLASS WORK ACTIVITY
	FRIDAY	13th AUG 2021	CLASS WORK ACTIVITY
	SATURDAY	14th AUG 2021	SECOND SATURDAY
	SUNDAY	15th AUG 2021	SUNDAY / INDEPENDENCE DAY
	MONDAY	16th AUG 2021	CLASS WORK ACTIVITY
	TUESDAY	17th AUG 2021	**SEMINAR ON YOGA**
	WEDNESDAY	18th AUG 2021	CLASS WORK ACTIVITY
	THURSDAY	19th AUG 2021	MOHARAM

	FRIDAY	20th AUG 2021	CLASS WORK ACTIVITY
	SATURDAY	21th AUG 2021	CLASS WORK ACTIVITY
	SUNDAY	22th AUG 2021	SUNDAY
	MONDAY	23th AUG 2021	CLASS WORK ACTIVITY
	TUESDAY	24th AUG 2021	CLASS WORK ACTIVITY
	WEDNESDAY	25th AUG 2021	CLASS WORK ACTIVITY
	THURSDAY	26th AUG 2021	SECOND MID TERM EXAM I YEAR - II SEM / Seminar on Stress Management
	FRIDAY	27th AUG 2021	SECOND MID TERM EXAM I YEAR - II SEM
	SATURDAY	28th AUG 2021	SECOND MID TERM EXAM I YEAR - II SEM
	SUNDAY	29th AUG 2021	SUNDAY
	MONDAY	30th AUG 2021	SECOND MID TERM EXAM I YEAR - II SEM
	TUESDAY	31th AUG 2021	SRI KRISHNA ASTAMI
	WEDNESDAY	1st SEP 2021	SECOND MID TERM EXAM I YEAR - II SEM
	THURSDAY	2nd SEP 2021	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - II SEM
	FRIDAY	3rd SEP 2021	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - II SEM
	SATURDAY	4th SEP 2021	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - II SEM
	SUNDAY	5th SEP 2021	SUNDAY
	MONDAY	6th SEP 2021	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - II SEM
	TUESDAY	7th SEP 2021	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - II SEM
	WEDNESDAY	8th SEP 2021	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - II SEM / SUBMISSION OF SECOND MID TERM EXAM FOR I, II,III, IV YEAR - II SEM
	THURSDAY	9th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
	FRIDAY	10th SEP 2021	VINAYAKA CHAVATHI
	SATURDAY	11th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
	SUNDAY	12th SEP 2021	SUNDAY
	MONDAY	13th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
	TUESDAY	14th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
	WEDNESDAY	15th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
	THURSDAY	16th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
	FRIDAY	17th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
	SATURDAY	18th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
	SUNDAY	19th SEP 2021	SUNDAY
	MONDAY	20th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
	TUESDAY	21th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM
	WEDNESDAY	22th SEP 2021	END SEMESTER EXAM FOR I YEAR II SEM

PRINCETON COLLEGE OF PHARMACY

Vijayapuri colony Chowdaryguda (V), Ghatkesar (M), Medchal (D), TS-500088
(Affiliated to JNTUH, Hyderabad & Approved by AICTE,PCI, New Delhi)

COLLEGE ACADEMIC CALENDER FOR THE ACADEMIC YEAR 2019-20

1	MONDAY	15th JULY 2019	COMMENCEMENT OF INSTRUCTION II, III, IV YEAR -I SEM
2	TUESDAY	16th JULY 2019	CLASS WORK ACTIVITY
3	WEDNESDAY	17th JULY2019	CLASS WORK ACTIVITY
4	THURSDAY	18th JULN 2019	CLASS WORK ACTIVITY
5	FRIDAY	19th JULY 2019	CLASS WORK ACTIVITY
6	SATURDAY	20th JULY 2019	CLASS WORK ACTIVITY
7	SUNDAY	21th JULY 2019	SUNDAY
8	MONDAY	22thJULY 2019	CLASS WORK ACTIVITY
9	TUESDAY	23th JULY 2019	CLASS WORK ACTIVITY
10	WEDNESDAY	24th JULY 2019	CLASS WORK ACTIVITY
11	THURSDAY	25th JULY 2019	CLASS WORK ACTIVITY
12	FRIDAY	26th JULY 2019	CLASS WORK ACTIVITY
13	SATURDAY	27th JULY 2019	CLASS WORK ACTIVITY
14	SUNDAY	28th JULY2019	SUNDAY
15	MONDAY	29th JULY 2019	BONALU
16	TUESDAY	30th JULY 2019	CLASS WORK ACTIVITY
17	WEDNESDAY	31th JULY 2019	CLASS WORK ACTIVITY
18	THURSDAY	1st AUG 2019	INDUCTION PROGRAMME I YEAR - I SEM
19	FRIDAY	2nd AUG 2019	INDUCTION PROGRAMME I YEAR - I SEM
20	SATURDAY	3rd AUG 2019	INDUCTION PROGRAMME I YEAR - I SEM
21	SUNDAY	4th AUG 2019	SUNDAY
22	MONDAY	5th AUG 2019	INDUCTION PROGRAMME I YEAR - I SEM
23	TUESDAY	6th AUG 2019	INDUCTION PROGRAMME I YEAR - I SEM
24	WEDNESDAY	7th AUG 2019	INDUCTION PROGRAMME I YEAR - I SEM
25	THURSDAY	8th AUG 2019	INDUCTION PROGRAMME I YEAR - I SEM
26	FRIDAY	9th AUG 2018	INDUCTION PROGRAMME I YEAR - I SEM
27	SATURDAY	10th AUG 2019	INDUCTION PROGRAMME I YEAR - I SEM
28	SUNDAY	11th AUG 2019	SUNDAY
29	MONDAY	12th AUG 2019	BAKRID
30	TUESDAY	13th AUG 2019	INDUCTION PROGRAMME I YEAR - I SEM
31	WEDNESDAY	14th AUG 2019	INDUCTION PROGRAMME I YEAR - I SEM
32	THURSDAY	15th AUG 2019	INDEPENDENCE DAY

33	FRIDAY	16th AUG 2019	COMMENCEMENT OF INSTRUCTION I YEAR -I SEM
34	SATURDAY	17th AUG 2019	CLASS WORK ACTIVITY
35	SUNDAY	18th AUG 2019	SUNDAY
36	MONDAY	19th AUG 2019	CLASS WORK ACTIVITY
37	TUESDAY	20th AUG 2019	Awareness session on New Education Policy and Startup Policy
38	WEDNESDAY	21th AUG 2019	CLASS WORK ACTIVITY
39	THURSDAY	22th AUG 2019	CLASS WORK ACTIVITY
40	FRIDAY	23th AUG 2019	CLASS WORK ACTIVITY
41	SATURDAY	24th AUG 2019	SRI KRISHNA ASTAMI
42	SUNDAY	25th AUG 2019	SUNDAY
43	MONDAY	26th AUG 2019	CLASS WORK ACTIVITY
44	TUESDAY	27th AUG 2019	CLASS WORK ACTIVITY
45	WEDNESDAY	28th AUG 2019	CLASS WORK ACTIVITY
46	THURSDAY	29th AUG 2019	CLASS WORK ACTIVITY
47	FRIDAY	30th AUG 2019	CLASS WORK ACTIVITY
48	SATURDAY	31th AUG 2019	CLASS WORK ACTIVITY
49	SUNDAY	1st SEP 2019	SUNDAY
50	MONDAY	2nd SEP 2019	VINAYAKA CHAVATHI
51	TUESDAY	3rd SEP 2019	CLASS WORK ACTIVITY
52	WEDNESDAY	4th SEP 2019	CLASS WORK ACTIVITY
53	THURSDAY	5th SEP 2019	TEACHER'S DAY
54	FRIDAY	6th SEP 2019	CLASS WORK ACTIVITY
55	SATURDAY	7th SEP 2019	CLASS WORK ACTIVITY
56	SUNDAY	8th SEP 2019	SUNDAY
57	MONDAY	9th SEP 2018	CLASS WORK ACTIVITY
58	TUESDAY	10th SEP 2019	MOHARAM
59	WEDNESDAY	11th SEP 2019	CLASS WORK ACTIVITY
60	THURSDAY	12th SEP 2019	FIRST MID TERM EXAMS FOR II,III, IV - I SEM
61	FRIDAY	13th SEP 2019	FIRST MID TERM EXAMS FOR II,III, IV - I SEM
62	SATURDAY	14th SEP 2019	FIRST MID TERM EXAMS FOR II,III, IV - I SEM
63	SUNDAY	15th SEP 2019	SUNDAY/ ENGINEER'S DAY
64	MONDAY	16th SEP 2019	CLASS WORK ACTIVITY
65	TUESDAY	17th SEP 2019	CLASS WORK ACTIVITY
66	WEDNESDAY	18th SEP 2019	CLASS WORK ACTIVITY
67	THURSDAY	19th SEP 2019	CLASS WORK ACTIVITY
68	FRIDAY	20th SEP 2019	SUBMISSION OF FIRST MID TERM EXAM MARKS TO UNIVERSITY II, III, IV SEM - I SEM
69	SATURDAY	21th SEP 2019	PARENT TEACHER MEETING FOR II,III,IV YEAR - I SEM
70	SUNDAY	22th SEP 2019	SUNDAY
71	MONDAY	23th SEP 2019	CLASS WORK ACTIVITY
72	TUESDAY	24th SEP 2019	CLASS WORK ACTIVITY
73	WEDNESDAY	25th SEP 2019	PHARMACIST DAY
74	THURSDAY	26th SEP 2019	CLASS WORK ACTIVITY
75	FRIDAY	27th SEP 2019	CLASS WORK ACTIVITY
76	SATURDAY	28th SEP 2019	BHATUKAMMA CELEBRATIONS
77	SUNDAY	29th SEP 2019	SUNDAY
78	MONDAY	30th SEP 2019	CLASS WORK ACTIVITY

79	TUESDAY	1st OCT 2019	CLASS WORK ACTIVITY
80	WEDNESDAY	2nd OCT 2019	MAHATHMA GANDHI JAYATHI
81	THURSDAY	3rd OCT 2019	CLASS WORK ACTIVITY
82	FRIDAY	4th OCT 2019	CLASS WORK ACTIVITY
83	SATURDAY	5th OCT 2019	CLASS WORK ACTIVITY
84	SUNDAY	6th OCT 2019	SUNDAY
85	MONDAY	7th OCT 2019	DUSSARA / DUSSEHRA RECESS
86	TUESDAY	8th OCT 2019	DUSSARA DUSSEHRA RECESS
87	WEDNESDAY	9th OCT 2018	DUSSEHRA RECESS
88	THURSDAY	10th OCT 2019	DUSSEHRA RECESS
89	FRIDAY	11th OCT 2019	DUSSEHRA RECESS
90	SATURDAY	12th OCT 2019	DUSSEHRA RECESS
91	SUNDAY	13th OCT 2019	SUNDAY
92	MONDAY	14th OCT 2019	DUSSEHRA RECESS
93	TUESDAY	15th OCT 2019	DUSSEHRA RECESS
94	WEDNESDAY	16th OCT 2019	DUSSEHRA RECESS
95	THURSDAY	17th OCT 2019	DUSSEHRA RECESS
96	FRIDAY	18th OCT 2019	DUSSEHRA RECESS
97	SATURDAY	19th OCT 2019	DUSSEHRA RECESS
98	SUNDAY	20th OCT 2019	SUNDAY
99	MONDAY	21th OCT 2019	CLASS WORK ACTIVITY
100	TUESDAY	22th OCT 2019	CLASS WORK ACTIVITY
101	WEDNESDAY	23th OCT 2019	CLASS WORK ACTIVITY
102	THURSDAY	24th OCT 2019	FIRST MID TERM EXAMS FOR I YEAR - I SEM
103	FRIDAY	25th OCT 2019	FIRST MID TERM EXAMS FOR I YEAR - I SEM
104	SATURDAY	26th OCT 2019	FIRST MID TERM EXAMS FOR I YEAR - I SEM
105	SUNDAY	27th OCT 2019	SUNDAY/ DEEPAVALI
106	MONDAY	28th OCT 2019	CLASS WORK ACTIVITY
107	TUESDAY	29th OCT 2019	CLASS WORK ACTIVITY
108	WEDNESDAY	30th OCT 2019	CLASS WORK ACTIVITY
109	THURSDAY	31th OCT 2019	CLASS WORK ACTIVITY
110	FRIDAY	1st NOV 2019	CLASS WORK ACTIVITY
111	SATURDAY	2nd NOV 2019	SUBMISSION OF FIRST MID TERM EXAM MARKS TO UNIVERSITY I YEART - I SEM
112	SUNDAY	3rd NOV 2019	SUNDAY
113	MONDAY	4th NOV 2019	CLASS WORK ACTIVITY
114	TUESDAY	5th NOV 2019	CLASS WORK ACTIVITY
115	WEDNESDAY	6th NOV 2019	Research Funding Opportunities for IT
116	THURSDAY	7th NOV 2019	CLASS WORK ACTIVITY
117	FRIDAY	8th NOV 2019	CLASS WORK ACTIVITY
118	SATURDAY	9th NOV 2018	PARENT TEACHER MEETING FOR I YEAR - I SEM
119	SUNDAY	10th NOV 2019	SUNDAY/ EID MILADIN NUBI
120	MONDAY	11th NOV 2019	CLASS WORK ACTIVITY
121	TUESDAY	12th NOV 2019	GURUNANAK BIRTHDAY

122	WEDNESDAY	13th NOV 2019	CLASS WORK ACTIVITY
123	THURSDAY	14th NOV 2019	CLASS WORK ACTIVITY
124	FRIDAY	15th NOV 2019	CLASS WORK ACTIVITY
125	SATURDAY	16th NOV 2019	LAST DAY OF INSTRUCTION I YEAR- I SEM
126	SUNDAY	17th NOV 2019	SUNDAY
127	MONDAY	18th NOV 2019	CLASS WORK ACTIVITY
128	TUESDAY	19th NOV 2019	CLASS WORK ACTIVITY
129	WEDNESDAY	20th NOV 2019	LAST DATE OF INSTRUCTION II,III,IV YEAR- I SEM
130	THURSDAY	21th NOV 2019	SECOND MID TERM EXAM FOR II, III, IV YEAR- I SEM
131	FRIDAY	22th NOV 2019	SECOND MID TERM EXAM FOR II, III, IV YEAR- I SEM
132	SATURDAY	23th NOV 2019	SECOND MID TERM EXAM FOR II, III, IV YEAR- I SEM
133	SUNDAY	24th NOV 2019	SUNDAY
134	MONDAY	25th NOV 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II, III, IV YEAR- I SEM
135	TUESDAY	26th NOV 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II, III, IV YEAR- I SEM / AWARENESS SESSION ON NATIONAL CONSTITUTION DAY
136	WEDNESDAY	27th NOV 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II, III, IV YEAR- I SEM
137	THURSDAY	28th NOV 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II, III, IV YEAR- I SEM
138	FRIDAY	29th NOV 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II, III, IV YEAR- I SEM
139	SATURDAY	30th NOV 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II, III, IV YEAR- I SEM / SUBMISSION OF SECOND MID TERM EXAM MARKS TO UNIVERSITY II, III, IV SEM - I SEM
140	SUNDAY	1st DEC 2019	SUNDAY
141	MONDAY	2nd DEC 2019	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
142	TUESDAY	3rd DEC 2019	CLASS WORK ACTIVITY
143	WEDNESDAY	4th DEC 2019	CLASS WORK ACTIVITY
144	THURSDAY	5th DEC 2019	CLASS WORK ACTIVITY
145	FRIDAY	6th DEC 2019	CLASS WORK ACTIVITY
146	SATURDAY	7th DEC 2019	CLASS WORK ACTIVITY
147	SUNDAY	8th DEC 2019	SUNDAY
148	MONDAY	9th DEC 2018	CLASS WORK ACTIVITY
149	TUESDAY	10th DEC 2019	CLASS WORK ACTIVITY
150	WEDNESDAY	11th DEC 2019	CLASS WORK ACTIVITY

151	THURSDAY	12th DEC 2019	CLASS WORK ACTIVITY
152	FRIDAY	13th DEC 2019	CLASS WORK ACTIVITY
153	SATURDAY	14th DEC 2019	SECOND SATURDAY
154	SUNDAY	15th DEC 2019	SUNDAY
155	MONDAY	16th DEC 2019	COMMENCEMENT OF INSTRUCTION FOR II, III,IV YEAR- II SEM
156	TUESDAY	17th DEC 2019	
157	WEDNESDAY	18th DEC 2019	SECOND MID TERM EXAMS FOR I YEAR - I SEM
158	THURSDAY	19th DEC 2019	SECOND MID TERM EXAMS FOR I YEAR - I SEM
159	FRIDAY	20th DEC 2019	SECOND MID TERM EXAMS FOR I YEAR - I SEM
160	SATURDAY	21th DEC 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR I YEAR- I SEM /
161	SUNDAY	22th DEC 2019	SUNDAY
162	MONDAY	23th DEC 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR I YEAR- I SEM / Industry Trainings on ADEPT PHARMA AN BIOSCIENCE EXCELLENCE PRIVATE LIMITED
163	TUESDAY	24th DEC 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR I YEAR- I SEM / Industry Trainings on ADEPT PHARMA AN BIOSCIENCE EXCELLENCE PRIVATE LIMITED
164	WEDNESDAY	25th DEC 2019	CHIRSTMAS
165	THURSDAY	26th DEC 2019	BOXING DAY
166	FRIDAY	27th DEC 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR I YEAR- I SEM
167	SATURDAY	28th DEC 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR I YEAR- I SEM / Industry Trainings on ADEPT PHARMA A BIOSCIENCE EXCELLENCE PRIVATE LIMITED.
168	SUNDAY	29th DEC 2019	SUNDAY
169	MONDAY	30th DEC 2019	END SEMESTER EXAMS FOR I YEAR - I SEM / Industry Trainings on ADEPT PHARMA A BIOSCIENCE EXCELLENCE PRIVATE LIMITED.
170	TUESDAY	31th DEC 2019	END SEMESTER EXAMS FOR I YEAR - I SEM / Industry Trainings on ADEPT PHARMA AN BIOSCIENCE EXCELLENCE PRIVATE LIMITED.
171	WEDNESDAY	1st JAN 2020	NEW YEAR
172	THURSDAY	2nd JAN 2020	END SEMESTER EXAMS FOR I YEAR - I SEM
173	FRIDAY	3rd JAN 2020	END SEMESTER EXAMS FOR I YEAR - I SEM
174	SATURDAY	4th JAN 2020	END SEMESTER EXAMS FOR I YEAR - I SEM
175	SUNDAY	5th JAN 2020	SUNDAY
176	MONDAY	6th JAN 2020	END SEMESTER EXAMS FOR I YEAR - I SEM
177	TUESDAY	7th JAN 2020	END SEMESTER EXAMS FOR I YEAR - I SEM
178	WEDNESDAY	8th JAN 2020	END SEMESTER EXAMS FOR I YEAR - I SEM
179	THURSDAY	9th JAN 2020	END SEMESTER EXAMS FOR I YEAR - I SEM

180	FRIDAY	10th JAN 2020	END SEMESTER EXAMS FOR I YEAR - I SEM
181	SATURDAY	11th JAN 2020	SECOND SATURDAY
182	SUNDAY	12th JAN 2020	SUNDAY / NATIONAL YOUTH DAY
183	MONDAY	13th JAN 2020	COMMENCEMENT OF INSTRUCTION FOR I YEAR- I SEM
184	TUESDAY	14th JAN 2020	BHOGI
185	WEDNESDAY	15th JAN 2020	SANKRATHI
186	THURSDAY	16th JAN 2020	SANKRATHI
187	FRIDAY	17th JAN 2020	CLASS WORK ACTIVITY
188	SATURDAY	18th JAN 2020	CLASS WORK ACTIVITY
189	SUNDAY	19th JAN 2020	SUNDAY
190	MONDAY	20th JAN 2020	CLASS WORK ACTIVITY
191	TUESDAY	21th JAN 2020	CLASS WORK ACTIVITY
192	WEDNESDAY	22thJAN 2020	CLASS WORK ACTIVITY
193	THURSDAY	23th JAN 2020	CLASS WORK ACTIVITY
194	FRIDAY	24th JAN 2020	One Day FDP on research Scope and Directions in Modern ERA
195	SATURDAY	25th JAN 2020	CLASS WORK ACTIVITY
196	SUNDAY	26th JAN 2020	SUNDAY
197	MONDAY	27th JAN 2020	CLASS WORK ACTIVITY
198	TUESDAY	28th JAN 2020	CLASS WORK ACTIVITY
199	WEDNESDAY	29th JAN 2020	CLASS WORK ACTIVITY
200	THURSDAY	30th JAN 2020	CLASS WORK ACTIVITY
201	FRIDAY	31th JAN 2020	CLASS WORK ACTIVITY
202	SATURDAY	1st FEB 2020	CLASS WORK ACTIVITY
203	SUNDAY	2nd FEB 2020	SUNDAY
204	MONDAY	3rd FEB 2020	CLASS WORK ACTIVITY
205	TUESDAY	4th FEB 2020	CLASS WORK ACTIVITY
206	WEDNESDAY	5th FEB 2020	CLASS WORK ACTIVITY
207	THURSDAY	6th FEB 2020	CLASS WORK ACTIVITY
208	FRIDAY	7th FEB 2020	CLASS WORK ACTIVITY
209	SATURDAY	8th FEB 2020	CLASS WORK ACTIVITY
210	SUNDAY	9th FEB 2020	SUNDAY
211	MONDAY	10th FEB 2020	SECOND MID TERM EXAM FOR II, III, IV YEAR- II SEM
212	TUESDAY	11th FEB 2020	SECOND MID TERM EXAM FOR II, III, IV YEAR- II SEM
213	WEDNESDAY	12th FEB 2020	SECOND MID TERM EXAM FOR II, III, IV YEAR- II SEM
214	THURSDAY	13th FEB 2020	CLASS WORK ACTIVITY
215	FRIDAY	14th FEB 2020	CLASS WORK ACTIVITY
216	SATURDAY	15th FEB 2020	CLASS WORK ACTIVITY
217	SUNDAY	16th FEB 2020	SUNDAY
218	MONDAY	17th FEB 2020	CLASS WORK ACTIVITY
219	TUESDAY	18th FEB 2020	CLASS WORK ACTIVITY
220	WEDNESDAY	19th FEB 2020	SUBMISSION OF FIRST MID TERM EXAM MARKS TO UNIVERSITY II, III, IV YEAR - II SEM
221	THURSDAY	20th FEB 2020	CLASS WORK ACTIVITY
222	FRIDAY	21th FEB 2020	MAHASHIVARATHI
223	SATURDAY	22th FEB 2020	CLASS WORK ACTIVITY
224	SUNDAY	23th FEB 2020	SUNDAY

225	MONDAY	24th FEB 2020	CLASS WORK ACTIVITY
226	TUESDAY	25th FEB 2020	CLASS WORK ACTIVITY
227	WEDNESDAY	26th FEB 2020	CLASS WORK ACTIVITY
228	THURSDAY	27th FEB 2020	CLASS WORK ACTIVITY
229	FRIDAY	28th FEB 2020	CLASS WORK ACTIVITY
230	SATURDAY	29th FEB 2020	CLASS WORK ACTIVITY
231	SUNDAY	1st MAR 2020	SUNDAY
232	MONDAY	2nd MAR 2020	CLASS WORK ACTIVITY
233	TUESDAY	3rd MAR 2020	CLASS WORK ACTIVITY
234	WEDNESDAY	4th MAR 2020	CLASS WORK ACTIVITY
235	THURSDAY	5th MAR 2020	FIRST MID TERM EXAMS FOR I YEAR - II SEM
236	FRIDAY	6th MAR 2020	FIRST MID TERM EXAMS FOR I YEAR - II SEM
237	SATURDAY	7th MAR 2020	FIRST MID TERM EXAMS FOR I YEAR - II SEM
238	SUNDAY	8th MAR 2020	SUNDAY / INTERNATIONAL WOMEN'S DAY
239	MONDAY	9th MAR 2020	HOLI
240	TUESDAY	10th MAR 2020	CLASS WORK ACTIVITY
241	WEDNESDAY	11th MAR 2020	CLASS WORK ACTIVITY
242	THURSDAY	12th MAR 2020	CLASS WORK ACTIVITY
243	FRIDAY	13th MAR 2020	CLASS WORK ACTIVITY
244	SATURDAY	14th MAR 2020	SUBMISSION OF FIRST MID TERM EXAM MARKS TO UNIVERSITY I YEART - II SEM PARENT TEACHER MEETING FOR II, III, IV YEAR- II SEM
245	SUNDAY	15th MAR 2020	SUNDAY
246	MONDAY	16th MAR 2020	CLASS WORK ACTIVITY
247	TUESDAY	17th MAR 2020	CLASS WORK ACTIVITY
248	WEDNESDAY	18th MAR 2020	CLASS WORK ACTIVITY
249	THURSDAY	19th MAR 2020	CLASS WORK ACTIVITY
250	FRIDAY	20th MAR 2020	CLASS WORK ACTIVITY
251	SATURDAY	21th MAR 2020	CLASS WORK ACTIVITY
252	SUNDAY	22th MAR 2020	SUNDAY
253	MONDAY	23th MAR 2020	CLASS WORK ACTIVITY
254	TUESDAY	24th MAR 2020	CLASS WORK ACTIVITY
255	WEDNESDAY	25th MAR 2020	UGADI
256	THURSDAY	26th MAR 2020	CLASS WORK ACTIVITY
257	FRIDAY	27th MAR 2020	CLASS WORK ACTIVITY
258	SATURDAY	28th MAR 2020	CLASS WORK ACTIVITY
259	SUNDAY	29th MAR 2020	SUNDAY
260	MONDAY	30th MAR 2020	CLASS WORK ACTIVITY
261	TUESDAY	31th MAR 2020	CLASS WORK ACTIVITY
262	WEDNESDAY	1st APR 2020	CLASS WORK ACTIVITY
263	THURSDAY	2nd APR 2020	CLASS WORK ACTIVITY
264	FRIDAY	3rd APR 2020	CLASS WORK ACTIVITY
265	SATURDAY	4th APR 2020	CLASS WORK ACTIVITY
266	SUNDAY	5th APR 2020	SUNDAY
267	MONDAY	6th APR 2020	CLASS WORK ACTIVITY
268	TUESDAY	7th APR 2020	LAST DATE OF INSTRUCTION FOR II, III, IV YEAR- II SEM
269	WEDNESDAY	8th APR 2020	SECOND MID TERM EXAM FOR II, III. IV YEAR - II SEM
270	THURSDAY	9th APR 2020	SECOND MID TERM EXAM FOR II, III. IV YEAR - II SEM

271	FRIDAY	10th APR 2020	SECOND MID TERM EXAM FOR II, III. IV YEAR - II SEM
272	SATURDAY	11th APR 2020	SECOND SATURDAY / PARENT TEACHER MEETING I YEAR- II SEM
273	SUNDAY	12th APR 2020	SUNDAY
274	MONDAY	13th APR 2020	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR II, III, IV YEAR - II SEM
275	TUESDAY	14th APR 2020	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR II, III, IV YEAR - II SEM
276	WEDNESDAY	15th APR 2020	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR II, III, IV YEAR - II SEM
277	THURSDAY	16th APR 2020	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR II, III, IV YEAR - II SEM
278	FRIDAY	17th APR 2020	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR II, III, IV YEAR - II SEM
279	SATURDAY	18th APR 2020	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR II, III, IV YEAR - II SEM
280	SUNDAY	19th APR 2020	SUNDAY
281	MONDAY	20th APR 2020	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
282	TUESDAY	21th APR 2020	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
283	WEDNESDAY	22th APR 2020	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
284	THURSDAY	23th APR 2020	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
285	FRIDAY	24th APR 2020	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
286	SATURDAY	25th APR 2020	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
287	SUNDAY	26th APR 2020	SUNDAY
288	MONDAY	27th APR 2020	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
289	TUESDAY	28th APR 2020	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
290	WEDNESDAY	29th APR 2020	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
291	THURSDAY	30th APR 2020	END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
292	FRIDAY	1st MAY 2020	LAST DATE OF INSTRUCTION FOR I YEAR- - II SEM / END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
293	SATURDAY	2nd MAY 2020	SECOND MID TERM EXAM FOR I YEAR- II SEM / END SEMESTER EXAMS FOR II, III, IV YEAR - II SEM
294	SUNDAY	3rd MAY 2020	SUNDAY
295	MONDAY	4th MAY 2020	SECOND MID TERM EXAM FOR I YEAR- II SEM / SUMMER VACATION II,III, IV YEAR
296	TUESDAY	5th MAY 2020	SECOND MID TERM EXAM FOR I YEAR- II SEM / SUMMER VACATION II,III, IV YEAR
297	WEDNESDAY	6th MAY 2020	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
298	THURSDAY	7th MAY 2020	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
299	FRIDAY	8th MAY 2020	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
300	SATURDAY	9th MAY 2020	SECOND SATURDAY
301	SUNDAY	10th MAY 2020	SUNDAY

302	MONDAY	11th MAY 2020	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - II SEM
303	TUESDAY	12th MAY 2020	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
304	WEDNESDAY	13th MAY 2020	PREPARATION HOLIDAY AND PRACTICAL EXAM FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
305	THURSDAY	14th MAY 2020	END SEMESTER EXAMS FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
306	FRIDAY	15th MAY 2020	END SEMESTER EXAMS FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
307	SATURDAY	16th MAY 2020	END SEMESTER EXAMS FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
308	SUNDAY	17th MAY 2020	SUNDAY
309	MONDAY	18th MAY 2020	END SEMESTER EXAMS FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
310	TUESDAY	19th MAY 2020	END SEMESTER EXAMS FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
311	WEDNESDAY	20th MAY 2020	END SEMESTER EXAMS FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
312	THURSDAY	21th MAY 2020	END SEMESTER EXAMS FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
313	FRIDAY	22th MAY 2020	END SEMESTER EXAMS FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
314	SATURDAY	23th MAY 2020	END SEMESTER EXAMS FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
315	SUNDAY	24th MAY 2020	SUNDAY
316	MONDAY	25th MAY 2020	END SEMESTER EXAMS FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
317	TUESDAY	26th MAY 2020	END SEMESTER EXAMS FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
318	WEDNESDAY	27th MAY 2020	END SEMESTER EXAMS FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
319	THURSDAY	28th MAY 2020	END SEMESTER EXAMS FOR I YEAR - II SEM / SUMMER VACATION II,III, IV YEAR
320	FRIDAY	29th MAY 2020	SUMMER VACATION
321	SATURDAY	30th MAY 2020	SUMMER VACATION
322	SUNDAY	31th MAY 2020	SUNDAY
323	MONDAY	1st JUN 2020	SUMMER VACATION
324	TUESDAY	2nd JUN 2020	SUMMER VACATION
325	WEDNESDAY	3rd JUN 2020	SUMMER VACATION
326	THURSDAY	4th JUN 2020	SUMMER VACATION
327	FRIDAY	5th JUN 2020	SUMMER VACATION

328	SATURDAY	6th JUN 2020	SUMMER VACATION
329	SUNDAY	7th JUN 2020	SUNDAY
330	MONDAY	8th JUN 2020	SUMMER VACATION
331	TUESDAY	9th JUN 2020	SUMMER VACATION
332	WEDNESDAY	10th JUN 2020	SUMMER VACATION
333	THURSDAY	11th JUN 2020	SUMMER VACATION
334	FRIDAY	12th JUN 2020	SUMMER VACATION
335	SATURDAY	13th JUN 2020	SECOND SATURDAY
336	SUNDAY	14th JUN 2020	SUNDAY
337	MONDAY	15th JUN 2020	SUMMER VACATION
338	TUESDAY	16th JUN 2020	SUMMER VACATION
339	WEDNESDAY	17th JUN 2020	SUMMER VACATION
340	THURSDAY	18th JUN 2020	SUMMER VACATION
341	FRIDAY	19th JUN 2020	SUMMER VACATION
342	SATURDAY	20th JUN 2020	SUMMER VACATION
343	SUNDAY	21th JUN 2020	SUNDAY
344	MONDAY	22thJUN 2020	SUMMER VACATION
345	TUESDAY	23th JUN 2020	SUMMER VACATION
346	WEDNESDAY	24th JUN 2020	SUMMER VACATION
347	THURSDAY	25th JUN 2020	SUMMER VACATION
348	FRIDAY	26th JUN 2020	SUMMER VACATION
349	SATURDAY	27th JUN 2020	SUMMER VACATION
350	SUNDAY	28th JUN 2020	SUNDAY
351	MONDAY	29th JUN 2020	SUMMER VACATION
352	TUESDAY	30th JUN 2020	SUMMER VACATION
353	WEDNESDAY	1st JULY 2020	SUMMER VACATION
354	THURSDAY	2nd JULY 2020	SUMMER VACATION
355	FRIDAY	3rd JULY 2020	SUMMER VACATION
356	SATURDAY	4th JULY 2020	SUMMER VACATION
357	SUNDAY	5th JULY 2020	SUNDAY /
358	MONDAY	6th JULY 2020	CLASS WORK ACTIVITY
359	TUESDAY	7th JULY 2020	CLASS WORK ACTIVITY
360	WEDNESDAY	8th JULY 2020	CLASS WORK ACTIVITY
361	THURSDAY	9th JULY 2020	CLASS WORK ACTIVITY
362	FRIDAY	10th JULY 2020	CLASS WORK ACTIVITY
363	SATURDAY	11th JULY 2020	CLASS WORK ACTIVITY
364	SUNDAY	12th JULY 2020	SUNDAY
365	MONDAY	13th JULY 2020	CLASS WORK ACTIVITY
366	TUESDAY	14th JULY 2020	CLASS WORK ACTIVITY
367	WEDNESDAY	15th JULY 2020	CLASS WORK ACTIVITY
368	THURSDAY	16th JULY 2020	CLASS WORK ACTIVITY
369	FRIDAY	17th JULY 2020	CLASS WORK ACTIVITY
370	SATURDAY	18th JULY 2020	CLASS WORK ACTIVITY
371	SUNDAY	19th JULY 2020	SUNDAY
372	MONDAY	20th JULY 2020	CLASS WORK ACTIVITY
373	TUESDAY	21st JULY 2020	CLASS WORK ACTIVITY
374	WEDNESDAY	22nd JULY 2020	CLASS WORK ACTIVITY
375	THURSDAY	23rd JULY 2020	CLASS WORK ACTIVITY

376	FRIDAY	24th JULY 2020	CLASS WORK ACTIVITY
377	SATURDAY	25th JULY 2020	CLASS WORK ACTIVITY
378	SUNDAY	26th JULY 2020	SUNDAY
379	MONDAY	27th JULY 2020	CLASS WORK ACTIVITY
380	TUESDAY	28th JULY 2020	CLASS WORK ACTIVITY
381	WEDNESDAY	29th JULY 2020	CLASS WORK ACTIVITY
382	THURSDAY	30th JULY 2020	CLASS WORK ACTIVITY
383	FRIDAY	31st JULY 2020	CLASS WORK ACTIVITY
384	SATURDAY	1st AUG 2020	CLASS WORK ACTIVITY
385	SUNDAY	2nd AUG 2020	
386	MONDAY	3rd AUG 2020	CLASS WORK ACTIVITY
387	TUESDAY	4th AUG 2020	CLASS WORK ACTIVITY
388	WEDNESDAY	5th AUG 2020	CLASS WORK ACTIVITY
389	THURSDAY	6th AUG 2020	CLASS WORK ACTIVITY
390	FRIDAY	7th AUG 2020	CLASS WORK ACTIVITY
391	SATURDAY	8th AUG 2020	CLASS WORK ACTIVITY
392	SUNDAY	9th AUG 2020	SUNDAY
393	MONDAY	10th AUG 2020	CLASS WORK ACTIVITY
394	TUESDAY	11th AUG 2020	CLASS WORK ACTIVITY
395	WEDNESDAY	12th AUG 2020	CLASS WORK ACTIVITY
396	THURSDAY	13th AUG 2020	CLASS WORK ACTIVITY
397	FRIDAY	14th AUG 2020	CLASS WORK ACTIVITY
398	SATURDAY	15th AUG 2020	CLASS WORK ACTIVITY
399	SUNDAY	16th AUG 2020	SUNDAY
400	MONDAY	17th AUG 2020	CLASS WORK ACTIVITY
401	TUESDAY	18th AUG 2020	CLASS WORK ACTIVITY
402	WEDNESDAY	19th AUG 2020	CLASS WORK ACTIVITY
403	THURSDAY	20th AUG 2020	CLASS WORK ACTIVITY
404	FRIDAY	21st AUG 2020	CLASS WORK ACTIVITY
405	SATURDAY	22nd AUG 2020	CLASS WORK ACTIVITY
406	SUNDAY	23rd AUG 2020	SUNDAY

PRINCETON COLLEGE OF PHARMACY

Vijayapuri colony Chowdaryguda (V), Ghatkesar (M), Medchal (D), TS-500088

(Affiliated to JNTUH, Hyderabad & Approved by AICTE,PCI, New Delhi)

COLLEGE ACADEMIC CALENDER FOR THE ACADEMIC YEAR 2018-19

1	MONDAY	9th JULY 2018	COMMENCEMENT OF INSTRUCTION FOR II,III,IV -I SEM
2	TUESDAY	10 th JULY 2018	CLASS WORK ACTIVITY
3	WEDNESDAY	11 th JULY 2018	CLASS WORK ACTIVITY
4	THURSDAY	12 th JULY 2018	CLASS WORK ACTIVITY
5	FRIDAY	13 th JULY 2018	CLASS WORK ACTIVITY
6	SATURDAY	14 th JULY 2018	SECOND SATURDAY
7	SUNDAY	15 th JULY 2018	SUNDAY
8	MONDAY	16 th JULY 2018	INDUCATION PROGRAMME I YEAR ISEM
9	TUESDAY	17 th JULY 2018	INDUCATION PROGRAMME I YEAR ISEM
10	WEDNESDAY	18 th JULY 2018	INDUCATION PROGRAMME I YEAR ISEM
11	THURSDAY	19 th JULY 2018	INDUCATION PROGRAMME I YEAR ISEM
12	FRIDAY	20 th JULY 2018	INDUCATION PROGRAMME I YEAR ISEM
13	SATURDAY	21 th JULY 2018	INDUCATION PROGRAMME I YEAR ISEM
14	SUNDAY	22 th JULY 2018	SUNDAY
15	MONDAY	23 th JULY 2018	INDUCATION PROGRAMME I YEAR ISEM
16	TUESDAY	24 th JULY 2018	INDUCATION PROGRAMME I YEAR ISEM
17	WEDNESDAY	25th JULY2018	INDUCATION PROGRAMME I YEAR ISEM
18	THURSDAY	26th JULY 2018	INDUCATION PROGRAMME I YEAR I SEM
19	FRIDAY	27th JULY 2018	INDUCATION PROGRAMME I YEAR ISEM
20	SATURDAY	28th JULY2018	INDUCATION PROGRAMME I YEAR ISEM
21	SUNDAY	29th JULY2018	SUNDAY
22	MONDAY	30th JULY 2018	COMMENCEMENT OF INSTRUCTION
23	TUESDAY	31th JULY2018	CLASS WORK ACTIVITY
24	WEDNESDAY	1st AUG 2018	CLASS WORK ACTIVITY
25	THURSDAY	2nd AUG 2018	CLASS WORK ACTIVITY
26	FRIDAY	3rd AUG 2018	CLASS WORK ACTIVITY
27	SATURDAY	4th AUG 2018	CLASS WORK ACTIVITY
28	SUNDAY	5th AUG 2018	SUNDAY
29	MONDAY	6th AUG 2018	BONALU
30	TUESDAY	7th AUG 2018	CLASS WORK ACTIVITY
31	WEDNESDAY	8th AUG 2018	CLASS WORK ACTIVITY
32	THURSDAY	9th AUG 2018	CLASS WORK ACTIVITY
33	FRIDAY	10th AUG 2018	CLASS WORK ACTIVITY
34	SATURDAY	11th AUG 2018	SECOND SATURDAY
35	SUNDAY	12th AUG 2018	SUNDAY
36	MONDAY	13th AUG 2018	CLASS WORK ACTIVITY
37	TUESDAY	14th AUG 2018	CLASS WORK ACTIVITY
38	WEDNESDAY	15th AUG 2018	INDEPENDENCE DAY
39	THURSDAY	16th AUG 2018	CLASS WORK ACTIVITY
40	FRIDAY	17th AUG 2018	BAMSLU
41	SATURDAY	18th AUG 2018	CLASS WORK ACTIVITY
42	SUNDAY	19th AUG 2018	SUNDAY
43	MONDAY	20th AUG 2018	CLASS WORK ACTIVITY
44	TUESDAY	21th AUG 2018	CLASS WORK ACTIVITY
45	WEDNESDAY	22th AUG 2018	BAKRID
46	THURSDAY	23th AUG 2018	CLASS WORK ACTIVITY
47	FRIDAY	24th AUG 2018	CLASS WORK ACTIVITY
48	SATURDAY	25th AUG 2018	CLASS WORK ACTIVITY
49	SUNDAY	26th AUG 2018	SUNDAY
50	MONDAY	27th AUG 2018	CLASS WORK ACTIVITY
51	TUESDAY	28th AUG 2018	CLASS WORK ACTIVITY
52	WEDNESDAY	29th AUG 2018	CLASS WORK ACTIVITY
53	THURSDAY	30th AUG 2018	CLASS WORK ACTIVITY
54	FRIDAY	31th AUG 2018	CLASS WORK ACTIVITY
55	SATURDAY	1st SEP 2018	SWACHH BHARAT ABHIYANN
56	SUNDAY	2nd SEP 2018	SUNDAY
57	MONDAY	3rd SEP 2018	SRI KRISHNA ASTHAMI
58	TUESDAY	4th SEP 2018	FIRST MID TERM EXAM II,III, IVYEAR I SEM

59	WEDNESDAY	5th SEP 2018	FIRST MID TERM EXAM II,III, IVYEAR I SEM / TEACHERS DAY
60	THURSDAY	6th SEP 2018	FIRST MID TERM EXAM II,III, IVYEAR I SEM
61	FRIDAY	7th SEP 2018	CLASS WORK ACTIVITY
62	SATURDAY	8th SEP 2018	SECOND SATURDAY
63	SUNDAY	9th SEP 2018	SUNDAY
64	MONDAY	10th SEP 2018	CLASS WORK ACTIVITY
65	TUESDAY	11th SEP 2018	CLASS WORK ACTIVITY
66	WEDNESDAY	12th SEP 2018	CLASS WORK ACTIVITY
67	THURSDAY	13th SEP 2018	VINAYAKA CHAVATHI
68	FRIDAY	14th SEP 2018	CLASS WORK ACTIVITY
69	SATURDAY	15th SEP 2018	ENGINEER'S DAY
70	SUNDAY	16th SEP 2018	SUNDAY
71	MONDAY	17th SEP 2018	CLASS WORK ACTIVITY
72	TUESDAY	18th SEP 2018	CLASS WORK ACTIVITY
73	WEDNESDAY	19th SEP 2018	CLASS WORK ACTIVITY
74	THURSDAY	20th SEP 2018	CLASS WORK ACTIVITY
75	FRIDAY	21th SEP 2018	MOHARAM
76	SATURDAY	22th SEP 2018	CLASS WORK ACTIVITY
77	SUNDAY	23th SEP 2018	SUNDAY
78	MONDAY	24th SEP 2018	FIRST MID TERM EXAM I YEAR ISEM
79	TUESDAY	25th SEP 2018	FIRST MID TERM EXAM I YEAR ISEM (PHARMACIST DAY)
80	WEDNESDAY	26th SEP 2018	FIRST MID TERM EXAM I YEAR ISEM
81	THURSDAY	27th SEP 2018	CLASS WORK ACTIVITY
82	FRIDAY	28th SEP 2018	CLASS WORK ACTIVITY
83	SATURDAY	29th SEP 2018	CLASS WORK ACTIVITY
84	SUNDAY	30th SEP 2018	SUNDAY
85	MONDAY	1st OCT 2018	CLASS WORK ACTIVITY
86	TUESDAY	2nd OCT 2018	MAHATHA GANDHI JAYATHI
87	WEDNESDAY	3rd OCT 2018	CLASS WORK ACTIVITY
88	THURSDAY	4th OCT 2018	SUBMISSION OF FIRST MID TERM EXAM MARKS TO UNIVERSITY
89	FRIDAY	5th OCT 2018	CLASS WORK ACTIVITY
90	SATURDAY	6th OCT 2018	BATHUKAMMA CELEBRATION
91	SUNDAY	7th OCT 2018	SUNDAY
92	MONDAY	8th OCT 2018	CLASS WORK ACTIVITY
93	TUESDAY	9th OCT 2018	BHUTUKAMMA STARTING DAY
94	WEDNESDAY	10th OCT 2018	CLASS WORK ACTIVITY
95	THURSDAY	11th OCT 2018	CLASS WORK ACTIVITY
96	FRIDAY	12th OCT 2018	CLASS WORK ACTIVITY
97	SATURDAY	13th OCT 2018	SECOND SATURDAY / PARENT TEACHER MEETING I,II, III, IBV YEAR - I SEM
98	SUNDAY	14th OCT 2018	SUNDAY
99	MONDAY	15th OCT 2018	DUSSEHRA RECESS I, II,III,IV YEAR I SEM
100	TUESDAY	16th OCT 2018	DUSSEHRA RECESS I, II,III,IV YEAR I SEM
101	WEDNESDAY	17th OCT 2018	DURGA ASTAMI / DUSSEHRA RECESS I,II,III,IV YEAR -I SEM
102	THURSDAY	18th OCT 2018	DUSSERA/ DUSSEHRA RECESS I,II,III,IV YEAR -I SEM
103	FRIDAY	19th OCT 2018	DUSSEHRA RECESS I, II,III,IV YEAR I SEM
104	SATURDAY	20th OCT 2018	DUSSEHRA RECESS I, II,III,IV YEAR I SEM
105	SUNDAY	21th OCT 2018	SUNDAY
106	MONDAY	22th OCT 2018	CLASS WORK ACTIVITY
107	TUESDAY	23th OCT 2018	CLASS WORK ACTIVITY
108	WEDNESDAY	24th OCT 2018	CLASS WORK ACTIVITY
109	THURSDAY	25th OCT 2018	CLASS WORK ACTIVITY
110	FRIDAY	26th OCT 2018	CLASS WORK ACTIVITY
111	SATURDAY	27th OCT 2018	CLASS WORK ACTIVITY
112	SUNDAY	28th OCT 2018	SUNDAY
113	MONDAY	29th OCT 2018	CLASS WORK ACTIVITY
114	TUESDAY	30th OCT 2018	CLASS WORK ACTIVITY
115	WEDNESDAY	31th OCT 2018	CLASS WORK ACTIVITY
116	THURSDAY	1st NOV 2018	CLASS WORK ACTIVITY
117	FRIDAY	2nd NOV 2018	CLASS WORK ACTIVITY
118	SATURDAY	3rd NOV 2018	CLASS WORK ACTIVITY
119	SUNDAY	4th NOV 2018	SUNDAY
120	MONDAY	5th NOV 2018	CLASS WORK ACTIVITY
121	TUESDAY	6th NOV 2018	CLASS WORK ACTIVITY
122	WEDNESDAY	7th NOV 2018	DEEPAVALI
123	THURSDAY	8th NOV 2018	CLASS WORK ACTIVITY

124	FRIDAY	9th NOV 2018	LEGAL SERVICE DAY
125	SATURDAY	10th NOV 2018	SECOND SATURDAY / LAST DATE OF INSTRUCTION FOR II,III,IV YEAR - I SEM
126	SUNDAY	11th NOV 2018	SUNDAY
127	MONDAY	12th NOV 2018	SECOND MID TERM EXAMS FOR II, III,IV YEAR - I SEM
128	TUESDAY	13th NOV 2018	SECOND MID TERM EXAMS FOR II, III,IV YEAR - I SEM
129	WEDNESDAY	14th NOV 2018	SECOND MID TERM EXAMS FOR II, III,IV YEAR - I SEM
130	THURSDAY	15th NOV 2018	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR II, III, IV YEAR -I SEM
131	FRIDAY	16th NOV 2018	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR II, III, IV YEAR -I SEM
132	SATURDAY	17th NOV 2018	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR II, III, IV YEAR -I SEM
133	SUNDAY	18th NOV 2018	SUNDAY
134	MONDAY	19th NOV 2018	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR II, III, IV YEAR -I SEM
135	TUESDAY	20th NOV 2018	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR II, III, IV YEAR -I SEM
136	WEDNESDAY	21th NOV 2018	EID MILADIN
137	THURSDAY	22th NOV 2018	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR II, III, IV YEAR -I SEM
138	FRIDAY	23th NOV 2018	KARTHIKA PURNAMI/ GURUNANK JAYATHI
139	SATURDAY	24th NOV 2018	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR II, III, IV YEAR -I SEM / SUBMISSION OF SECOND TERM EXAM MARKS TO UNIVERSITY FOR II,III, IV YEAR - I SEM
140	SUNDAY	25th NOV 2018	SUNDAY
141	MONDAY	26th NOV 2018	END SEMESTER / SUPPLEMENTARY EXAMS FOR II, III, IV - I SEM
142	TUESDAY	27th NOV 2018	END SEMESTER / SUPPLEMENTARY EXAMS FOR II, III, IV - I SEM
143	WEDNESDAY	28th NOV 2018	LAST DAY OF INSTRUCTION I YEAR- I SEM / END SEMESTER / SUPPLEMENTARY EXAMS FOR II, III, IV - I SEM
144	THURSDAY	29th NOV 2018	SECOND MID TERM EXAM I YEAR -I SEM/ END SEMESTER / SUPPLEMENTARY EXAMS FOR II, III, IV - I SEM
145	FRIDAY	30th NOV 2018	SECOND MID TERM EXAM I YEAR -I SEM / END SEMESTER / SUPPLEMENTARY EXAMS FOR II, III, IV - I SEM
146	SATURDAY	1st DEC 2018	SECOND MID TERM EXAM I YEAR -I SEM / END SEMESTER / SUPPLEMENTARY EXAMS FOR II, III, IV - I SEM
147	SUNDAY	2nd DEC 2018	SUNDAY
148	MONDAY	3rd DEC 2018	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR I YEAR -I SEM / END SEMESTER / SUPPLEMENTARY EXAMS FOR II, III, IV - I SEM
149	TUESDAY	4th DEC 2018	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR I YEAR -I SEM / END SEMESTER / SUPPLEMENTARY EXAMS FOR II, III, IV - I SEM
150	WEDNESDAY	5th DEC 2018	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR I YEAR -I SEM / END SEMESTER / SUPPLEMENTARY EXAMS FOR II, III, IV - I SEM
151	THURSDAY	6th DEC 2018	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR I YEAR -I SEM / END SEMESTER / SUPPLEMENTARY EXAMS FOR II, III, IV - I SEM
152	FRIDAY	7th DEC 2018	ELECTIONS
153	SATURDAY	8th DEC 2018	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR I YEAR -I SEM / END SEMESTER / SUPPLEMENTARY EXAMS FOR II, III, IV - I SEM
154	SUNDAY	9th DEC 2018	SUNDAY
155	MONDAY	10th DEC 2018	SEMSETER BREAK FOR II, III, IV -I SEM/ END SEMESTER/ SUPPLEMENTARY EXAMS FOR I YEAR - ISEM
156	TUESDAY	11th DEC 2018	SEMSETER BREAK FOR II, III, IV -I SEM/ END SEMESTER/ SUPPLEMENTARY EXAMS FOR I YEAR - ISEM
157	WEDNESDAY	12th DEC 2018	SEMSETER BREAK FOR II, III, IV -I SEM/ END SEMESTER/ SUPPLEMENTARY EXAMS FOR I YEAR - ISEM
158	THURSDAY	13th DEC 2018	SEMSETER BREAK FOR II, III, IV -I SEM/ END SEMESTER/ SUPPLEMENTARY EXAMS FOR I YEAR - ISEM
159	FRIDAY	14th DEC 2018	SEMSETER BREAK FOR II, III, IV -I SEM/ END SEMESTER/ SUPPLEMENTARY EXAMS FOR I YEAR - ISEM
160	SATURDAY	15th DEC 2018	SEMSETER BREAK FOR II, III, IV -I SEM/ END SEMESTER/ SUPPLEMENTARY EXAMS FOR I YEAR - ISEM
161	SUNDAY	16th DEC 2018	SUNDAY
162	MONDAY	17th DEC 2018	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I YEAR - ISEM
163	TUESDAY	18th DEC 2018	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I YEAR - ISEM
164	WEDNESDAY	19th DEC 2018	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I YEAR - ISEM
165	THURSDAY	20th DEC 2018	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I YEAR - ISEM
166	FRIDAY	21th DEC 2018	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I YEAR - ISEM
167	SATURDAY	22th DEC 2018	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I YEAR - ISEM
168	SUNDAY	23th DEC 2018	SUNDAY
169	MONDAY	24th DEC 2018	COMMENCEMENT OF INSTRUCTION FOR II, III,IV YEAR- I SEM / SEM BREAK FOR I YEAR - I SEM
170	TUESDAY	25th DEC 2018	CHIRSTMAS
171	WEDNESDAY	26th DEC 2018	BOXING DAY

172	THURSDAY	27th DEC 2018	SEM BREAK FOR I YEAR - I SEM
173	FRIDAY	28th DEC 2018	SEM BREAK FOR I YEAR - I SEM
174	SATURDAY	29th DEC 2018	SEM BREAK FOR I YEAR - I SEM
175	SUNDAY	30th DEC 2018	SUNDAY
176	MONDAY	31th DEC 2018	
177	TUESDAY	1st JAN 2019	NEW YEAR / WEBINAR ON Disposal of E-Waste
178	WEDNESDAY	2nd JAN 2019	COMMENCEMENT OF INSTRUCTION I YEAR - II SEM
179	THURSDAY	3rd JAN 2019	CLASS WORK ACTIVITY
180	FRIDAY	4th JAN 2019	CLASS WORK ACTIVITY
181	SATURDAY	5th JAN 2019	CLASS WORK ACTIVITY
182	SUNDAY	6th JAN 2019	SUNDAY
183	MONDAY	7th JAN 2019	CLASS WORK ACTIVITY
184	TUESDAY	8th JAN 2019	CLASS WORK ACTIVITY
185	WEDNESDAY	9th JAN 2018	CLASS WORK ACTIVITY
186	THURSDAY	10th JAN 2019	CLASS WORK ACTIVITY
187	FRIDAY	11th JAN 2019	CLASS WORK ACTIVITY
188	SATURDAY	12th JAN 2019	SECOND SATURDAY / NATIONAL YOUTH DAY
189	SUNDAY	13th JAN 2019	SUNDAY
190	MONDAY	14th JAN 2019	SANKRATHI
191	TUESDAY	15th JAN 2019	SANKRATHI
192	WEDNESDAY	16th JAN 2019	CLASS WORK ACTIVITY
193	THURSDAY	17th JAN 2019	CLASS WORK ACTIVITY
194	FRIDAY	18th JAN 2019	CLASS WORK ACTIVITY
195	SATURDAY	19th JAN 2019	CLASS WORK ACTIVITY
196	SUNDAY	20th JAN 2019	SUNDAY
197	MONDAY	21th JAN 2019	CLASS WORK ACTIVITY
198	TUESDAY	22thJAN 2019	CLASS WORK ACTIVITY
199	WEDNESDAY	23th JAN 2019	CLASS WORK ACTIVITY
200	THURSDAY	24th JAN 2019	CLASS WORK ACTIVITY
201	FRIDAY	25th JAN 2019	NATIONAL VOTER DAY / CLASS WORK ACTIVITY
202	SATURDAY	26th JAN 2019	REPUBLIC DAY
203	SUNDAY	27th JAN 2019	SUNDAY
204	MONDAY	28th JAN 2019	CLASS WORK ACTIVITY
205	TUESDAY	29th JAN 2019	CLASS WORK ACTIVITY
206	WEDNESDAY	30th JAN 2019	CLASS WORK ACTIVITY
207	THURSDAY	31th JAN 2019	CLASS WORK ACTIVITY
208	FRIDAY	1st FEB 2019	CLASS WORK ACTIVITY
209	SATURDAY	2nd FEB 2019	CLASS WORK ACTIVITY
210	SUNDAY	3rd FEB 2019	SUNDAY
211	MONDAY	4th FEB 2019	CLASS WORK ACTIVITY
212	TUESDAY	5th FEB 2019	CLASS WORK ACTIVITY
213	WEDNESDAY	6th FEB 2019	CLASS WORK ACTIVITY
214	THURSDAY	7th FEB 2019	CLASS WORK ACTIVITY
215	FRIDAY	8th FEB 2019	CLASS WORK ACTIVITY
216	SATURDAY	9th FEB 2019	CLASS WORK ACTIVITY
217	SUNDAY	10th FEB 2019	SUNDAY
218	MONDAY	11th FEB 2019	CLASS WORK ACTIVITY
219	TUESDAY	12th FEB 2019	CLASS WORK ACTIVITY
220	WEDNESDAY	13th FEB 2019	CLASS WORK ACTIVITY
221	THURSDAY	14th FEB 2019	CLASS WORK ACTIVITY
222	FRIDAY	15th FEB 2019	
223	SATURDAY	16th FEB 2019	CLASS WORK ACTIVITY
224	SUNDAY	17th FEB 2019	SUNDAY
225	MONDAY	18th FEB 2019	FIRST MID TERM EXAM II, III,IV YEAR – IISEM
226	TUESDAY	19th FEB 2019	FIRST MID TERM EXAM II, III,IV YEAR – IISEM
227	WEDNESDAY	20th FEB 2019	FIRST MID TERM EXAM II, III,IV YEAR – IISEM
228	THURSDAY	21th FEB 2019	CLASS WORK ACTIVITY
229	FRIDAY	22th FEB 2019	CLASS WORK ACTIVITY
230	SATURDAY	23th FEB 2019	CLASS WORK ACTIVITY

231	SUNDAY	24th FEB 2019	SUNDAY
232	MONDAY	25th FEB 2019	CLASS WORK ACTIVITY
233	TUESDAY	26th FEB 2019	CLASS WORK ACTIVITY
234	WEDNESDAY	27th FEB 2019	FIRST MID TERM EXAM I YEAR - IISEM / SUBMISSION OF FIRST MID TERM EXAM MARKS TO UNIVERSITY FOR II,III,IV YEAR - II SEM
235	THURSDAY	28th FEB 2019	FIRST MID TERM EXAM I YEAR – IISEM
236	FRIDAY	1st MAR 2019	FIRST MID TERM EXAM I YEAR – IISEM
237	SATURDAY	2nd MAR 2019	CLASS WORK ACTIVITY
238	SUNDAY	3rd MAR 2019	SUNDAY
239	MONDAY	4th MAR 2019	MAHASHIVARATHRI
240	TUESDAY	5th MAR 2019	CLASS WORK ACTIVITY
241	WEDNESDAY	6th MAR 2019	CLASS WORK ACTIVITY
242	THURSDAY	7th MAR 2019	CLASS WORK ACTIVITY
243	FRIDAY	8th MAR 2019	SUBMISSION OF FIRST MID TERM EXAM MARKS TO UNIVERSITY / INTERNATIONAL WOMEN'S DAY
244	SATURDAY	9th MAR 2018	SECOND SATURDAY / PARENT TEACHER MEETING I,II, III, IBV YEAR - II SEM
245	SUNDAY	10th MAR 2019	SUNDAY
246	MONDAY	11th MAR2019	CLASS WORK ACTIVITY
247	TUESDAY	12th MAR 2019	CLASS WORK ACTIVITY
248	WEDNESDAY	13th MAR 2019	CLASS WORK ACTIVITY
249	THURSDAY	14th MAR 2019	CLASS WORK ACTIVITY
250	FRIDAY	15th MAR 2019	CLASS WORK ACTIVITY
251	SATURDAY	16th MAR 2019	CLASS WORK ACTIVITY
252	SUNDAY	17th MAR 2019	SUNDAY
253	MONDAY	18th MAR 2019	CLASS WORK ACTIVITY
254	TUESDAY	19th MAR 2019	CLASS WORK ACTIVITY
255	WEDNESDAY	20th MAR 2019	Industrial Policy
256	THURSDAY	21th MAR 2019	HOLI
257	FRIDAY	22th MAR 2019	CLASS WORK ACTIVITY
258	SATURDAY	23th MAR 2019	CLASS WORK ACTIVITY
259	SUNDAY	24th MAR 2019	SUNDAY
260	MONDAY	25th MAR 2019	CLASS WORK ACTIVITY
261	TUESDAY	26th MAR 2019	CLASS WORK ACTIVITY
262	WEDNESDAY	27th MAR 2019	CLASS WORK ACTIVITY
263	THURSDAY	28th MAR 2019	CLASS WORK ACTIVITY
264	FRIDAY	29th MAR 2019	CLASS WORK ACTIVITY
265	SATURDAY	30th MAR 2019	CLASS WORK ACTIVITY
266	SUNDAY	31th MAR 2019	SUNDAY
267	MONDAY	1st APR 2019	CLASS WORK ACTIVITY
268	TUESDAY	2nd APR 2019	CLASS WORK ACTIVITY
269	WEDNESDAY	3rd APR 2019	CLASS WORK ACTIVITY
270	THURSDAY	4th APR 2019	CLASS WORK ACTIVITY
271	FRIDAY	5th APR 2019	BABU JAGJIVAN BIRTHDAY
272	SATURDAY	6th APR 2019	UGADI
273	SUNDAY	7th APR 2019	SUNDAY
274	MONDAY	8th APR 2019	CLASS WORK ACTIVITY
275	TUESDAY	9th APR 2018	CLASS WORK ACTIVITY
276	WEDNESDAY	10th APR 2019	CLASS WORK ACTIVITY
277	THURSDAY	11th APR 2019	CLASS WORK ACTIVITY
278	FRIDAY	12th APR 2019	CLASS WORK ACTIVITY
279	SATURDAY	13th APR 2019	SECOND SATURDAY
280	SUNDAY	14th APR 2019	SUNDAY/ Dr. BR AMBEDKAR JAYATHI/SRI RAMA NAVAMI
281	MONDAY	15th APR 2019	CLASS WORK ACTIVITY
282	TUESDAY	16th APR 2019	CLASS WORK ACTIVITY
283	WEDNESDAY	17th APR 2019	CLASS WORK ACTIVITY
284	THURSDAY	18th APR 2019	GROCERY DISTRIBUTION
285	FRIDAY	19th APR 2019	GOOD FRIDAY
286	SATURDAY	20th APR 2019	LAST DATE OF INSTRUCTION II,III,IV YEAR- II SEM
287	SUNDAY	21th APR 2019	SUNDAY
288	MONDAY	22th APR 2019	SECOND MID TERM EXAM II,III,IV YEAR -II SEM
289	TUESDAY	23th APR 2019	SECOND MID TERM EXAM II,III,IV YEAR -II SEM
290	WEDNESDAY	24th APR 2019	SECOND MID TERM EXAM I, II, III, IV YEAR -II SEM
291	THURSDAY	25th APR 2019	SECOND MID TERM EXAM I YEAR -II SEM / PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II,III,IV- II SEM

292	FRIDAY	26th APR 2019	SECOND MID TERM EXAM I YEAR -II SEM / PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II,III,IV- II SEM
293	SATURDAY	27th APR 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR I YEAR -II SEM / PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II,III,IV- II SEM
294	SUNDAY	28th APR 2019	SUNDAY
295	MONDAY	29th APR 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR I YEAR -II SEM / PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II,III,IV- II SEM
296	TUESDAY	30th APR 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR I YEAR -II SEM / PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II,III,IV- II SEM
297	WEDNESDAY	1st MAY 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR I YEAR -II SEM / PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II,III,IV- II SEM
298	THURSDAY	2nd MAY 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR I YEAR -II SEM / PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II,III,IV- II SEM / SUBMISSION OF SECOND MID TERM EXAM MARKS OF II , III, IV- II SEM
299	FRIDAY	3rd MAY 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR I YEAR -II SEM / SUBMISSION OF SECOND MID TERM EXAM I YEAR- I SEM
300	SATURDAY	4th MAY 2019	PREPARATION HOLIDAYS AND PRACTICAL EXAMS FOR I YEAR -II SEM / PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR II,III,IV- II SEM
301	SUNDAY	5th MAY 2019	SUNDAY / Seminar on Internships & Industry Trainings (ONLINE)
302	MONDAY	6th MAY 2019	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I, II, III, IV YEAR - II SEM
303	TUESDAY	7th MAY 2019	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I, II, III, IV YEAR - II SEM
304	WEDNESDAY	8th MAY 2019	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I, II, III, IV YEAR - II SEM
305	THURSDAY	9th MAY 2018	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I, II, III, IV YEAR - II SEM
306	FRIDAY	10th MAY 2019	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I, II, III, IV YEAR - II SEM
307	SATURDAY	11th MAY 2019	SECOND SATURDAY
308	SUNDAY	12th MAY 2019	SUNDAY
309	MONDAY	13th MAY 2019	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I, II, III, IV YEAR - II SEM
310	TUESDAY	14th MAY 2019	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I, II, III, IV YEAR - II SEM
311	WEDNESDAY	15th MAY 2019	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I, II, III, IV YEAR - II SEM
312	THURSDAY	16th MAY 2019	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I, II, III, IV YEAR - II SEM
313	FRIDAY	17th MAY 2019	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I, II, III, IV YEAR - II SEM
314	SATURDAY	18th MAY 2019	END SEMESTER/ SUPPLEMENTARY EXAMS FOR I, II, III, IV YEAR - II SEM
315	SUNDAY	19th MAY 2019	SUNDAY
316	MONDAY	20th MAY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
317	TUESDAY	21th MAY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
318	WEDNESDAY	22th MAY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
319	THURSDAY	23th MAY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
320	FRIDAY	24th MAY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
321	SATURDAY	25th MAY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
322	SUNDAY	26th MAY 2019	SUNDAY
323	MONDAY	27th MAY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
324	TUESDAY	28th MAY 2019	SUMMER VACATION FOR I YEAR -II SEM
325	WEDNESDAY	29th MAY 2019	SUMMER VACATION FOR I YEAR -II SEM
326	THURSDAY	30th MAY 2019	SUMMER VACATION FOR I YEAR -II SEM
327	FRIDAY	31th MAY 2019	SUMMER VACATION FOR I YEAR -II SEM
328	SATURDAY	1st JUN 2019	SUMMER VACATION FOR I YEAR -II SEM
329	SUNDAY	2nd JUN 2019	SUNDAY
330	MONDAY	3rd JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
331	TUESDAY	4th JUN 2019	SUMMER VACATION FOR I YEAR -II SEM
332	WEDNESDAY	5th JUN 2019	EIDUL FITAR RAMZAN
333	THURSDAY	6th JUN 2019	EIDUL FITAR RAMZAN
334	FRIDAY	7th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
335	SATURDAY	8th JUN 2019	SUMMER VACATION FOR I YEAR -II SEM
336	SUNDAY	9th JUN 2018	SUNDAY
337	MONDAY	10th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
338	TUESDAY	11th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
339	WEDNESDAY	12th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
340	THURSDAY	13th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
341	FRIDAY	14th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
342	SATURDAY	15th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
343	SUNDAY	16th JUN 2019	SUNDAY
344	MONDAY	17th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
345	TUESDAY	18th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
346	WEDNESDAY	19th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM

347	THURSDAY	20th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
348	FRIDAY	21th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
349	SATURDAY	22thJUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
350	SUNDAY	23th JUN 2019	SUNDAY
351	MONDAY	24th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
352	TUESDAY	25th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
353	WEDNESDAY	26th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
354	THURSDAY	27th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
355	FRIDAY	28th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
356	SATURDAY	29th JUN 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
357	SUNDAY	30th JUN 2019	SUNDAY
358	MONDAY	1st JULY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
359	TUESDAY	2nd JULY2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
360	WEDNESDAY	3rd JULY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
361	THURSDAY	4th JULY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
362	FRIDAY	5th JULY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
363	SATURDAY	6th JULY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
364	SUNDAY	7th JULY 2019	SUNDAY
365	MONDAY	8th JULY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
366	TUESDAY	9th JULY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
367	WEDNESDAY	10th JULY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
368	THURSDAY	11th JULY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
369	FRIDAY	12th JULY 2019	SUMMER VACATION FOR I, II, III, IV YEAR -II SEM
370	SATURDAY	13th JULY 2019	SECOND SATURDAY
371	SUNDAY	14th JULY 2019	SUNDAY

PRINCETON COLLEGE OF PHARMACY
Vijayapuri colony Chowdaryguda (V), Ghatkesar (M), Medchal (D), TS-500088
(Affiliated to JNTUH, Hyderabad & Approved by AICTE,PCI, New Delhi)

COLLEGE ACADEMIC CALENDER FOR THE ACADEMIC YEAR 2017-18

WEDNESDAY	12th JULY 2017	COMMENCEMERNT OF INSTRUCTION FOR II.III.IV YEAR -I SEM
THURSDAY	13th JULY 2017	CLASS WORK ACTIVITY
FRIDAY	14th JULY 2017	CLASS WORK ACTIVITY
SATURDAY	15th JULY2017	CLASS WORK ACTIVITY
SUNDAY	16th JULY 2017	SUNDAY
MONDAY	17th JULY 2017	BONALU
TUESDAY	18th JULY 2017	CLASS WORK ACTIVITY
WEDNESDAY	19th JULY 2017	CLASS WORK ACTIVITY
THURSDAY	20th JULY 2017	CLASS WORK ACTIVITY
FRIDAY	21th JULY 2017	CLASS WORK ACTIVITY
SATURDAY	22thJULY 2017	CLASS WORK ACTIVITY
SUNDAY	23th JULY 2017	SUNDAY
MONDAY	24th JULY 2017	INDUCTION PROGRAM/ ORIENTATION PROGRAM I YEAR I SEM
TUESDAY	25th JULY 2017	INDUCTION PROGRAM/ ORIENTATION PROGRAM I YEAR I SEM
WEDNESDAY	26th JULY 2017	COMMENCEMENT OF INSTRUCTION OF I YEAR- ISEM
THURSDAY	27th JULY 2017	CLASS WORK ACTIVITY
FRIDAY	28th JULY 2017	CLASS WORK ACTIVITY
SATURDAY	29th JULY 2017	CLASS WORK ACTIVITY
SUNDAY	30th JULY 2017	SUNDAY
MONDAY	31th JULY 2017	CLASS WORK ACTIVITY
TUESDAY	1st AUG 2017	CLASS WORK ACTIVITY
WEDNESDAY	2nd AUG 2017	CLASS WORK ACTIVITY
THURSDAY	3rd AUG 2017	CLASS WORK ACTIVITY
FRIDAY	4th AUG 2017	CLASS WORK ACTIVITY
SATURDAY	5th AUG 2017	CLASS WORK ACTIVITY
SUNDAY	6th AUG 2017	SUNDAY
MONDAY	7th AUG 2017	CLASS WORK ACTIVITY
TUESDAY	8th AUG 2017	CLASS WORK ACTIVITY
WEDNESDAY	9th AUG 2017	CLASS WORK ACTIVITY
THURSDAY	10th AUG 2017	CLASS WORK ACTIVITY
FRIDAY	11th AUG 2017	
SATURDAY	12th AUG 2017	SECOND SATURDAY
SUNDAY	13th AUG 2017	SUNDAY
MONDAY	14th AUG 2017	KRISHNA ASHTAMI
TUESDAY	15th AUG 2017	INDEPENDENCE DAY
WEDNESDAY	16th AUG 2017	CLASS WORK ACTIVITY
THURSDAY	17th AUG 2017	CLASS WORK ACTIVITY
FRIDAY	18th AUG 2017	CLASS WORK ACTIVITY

SATURDAY	19th AUG 2017	CLASS WORK ACTIVITY
SUNDAY	20th AUG 2017	SUNDAY
MONDAY	21th AUG 2017	CLASS WORK ACTIVITY
TUESDAY	22th AUG 2017	CLASS WORK ACTIVITY
WEDNESDAY	23th AUG 2017	CLASS WORK ACTIVITY
THURSDAY	24th AUG 2017	CLASS WORK ACTIVITY
FRIDAY	25th AUG 2017	VINAYAKA CHAVITHI
SATURDAY	26th AUG 2017	CLASS WORK ACTIVITY
SUNDAY	27th AUG 2017	SUNDAY
MONDAY	28th AUG 2017	CLASS WORK ACTIVITY
TUESDAY	29th AUG 2017	CLASS WORK ACTIVITY
WEDNESDAY	30th AUG 2017	CLASS WORK ACTIVITY
THURSDAY	31th AUG 2017	CLASS WORK ACTIVITY
FRIDAY	1st SEP 2017	CLASS WORK ACTIVITY
SATURDAY	2nd SEP 2017	EIDUL
SUNDAY	3rd SEP 2017	SUNDAY
MONDAY	4th SEP 2017	CLASS WORK ACTIVITY
TUESDAY	5th SEP 2017	GANESH NIMARAJAN / TEACHERS DAY
WEDNESDAY	6th SEP 2017	FIRST MID EXAMS II,III,IV YEAR I SEM
THURSDAY	7th SEP 2017	FIRST MID EXAMS II,III,IV YEAR I SEM
FRIDAY	8th SEP 2017	FIRST MID EXAMS II,III,IV YEAR I SEM
SATURDAY	9th SEP 2017	CLASS WORK ACTIVITY
SUNDAY	10th SEP 2017	SUNDAY
MONDAY	11th SEP 2017	CLASS WORK ACTIVITY
TUESDAY	12th SEP 2017	CLASS WORK ACTIVITY
WEDNESDAY	13th SEP 2017	CLASS WORK ACTIVITY
THURSDAY	14th SEP 2017	CLASS WORK ACTIVITY
FRIDAY	15th SEP 2017	ENGINEER'S DAY
SATURDAY	16th SEP 2017	SUBMISSION OF FIRST MID TERM EXAM MARKS TO UNIVERSITYT
SUNDAY	17th SEP 2017	SUNDAY
MONDAY	18th SEP 2017	CLASS WORK ACTIVITY
TUESDAY	19th SEP 2017	CLASS WORK ACTIVITY
WEDNESDAY	20th SEP 2017	CLASS WORK ACTIVITY
THURSDAY	21th SEP 2017	FIRST MID EXAMS I YEAR I SEM
FRIDAY	22th SEP 2017	FIRST MID EXAMS I YEAR I SEM
SATURDAY	23th SEP 2017	FIRST MID EXAMS I YEAR I SEM
SUNDAY	24th SEP 2017	SUNDAY
MONDAY	25th SEP 2017	PHARMACIST DAY
TUESDAY	26th SEP 2017	DUSSEHRA RECESS
WEDNESDAY	27th SEP 2017	DUSSEHRA RECESS
THURSDAY	28th SEP 2017	DUSSEHRA RECESS
FRIDAY	29th SEP 2017	DUSSEHRA RECESS

SATURDAY	30th SEP 2017	DUSSEHRA RECESS
SUNDAY	1st OCT 2017	SUNDAY
MONDAY	2nd OCT 2017	MAHATMA GANDHI JAYATHI
TUESDAY	3rd OCT 2017	GOVERNMENT HOLIDAY
WEDNESDAY	4th OCT 2017	CLASS WORK ACTIVITY
THURSDAY	5th OCT 2017	CLASS WORK ACTIVITY
FRIDAY	6th OCT 2017	CLASS WORK ACTIVITY
SATURDAY	7th OCT 2017	SUBMISSION OF FIRST MID TERM EXAM MARKS TO UNIVERSITY
SUNDAY	8th OCT 2017	SUNDAY
MONDAY	9th OCT 2017	CLASS WORK ACTIVITY
TUESDAY	10th OCT 2017	CLASS WORK ACTIVITY
WEDNESDAY	11th OCT 2017	CLASS WORK ACTIVITY
THURSDAY	12th OCT 2017	CLASS WORK ACTIVITY
FRIDAY	13th OCT 2017	CLASS WORK ACTIVITY
SATURDAY	14th OCT 2017	SECOND SATURDAY/ PARENT- TEACHER MEETING I,II,III,IV YEAR - I SEM
SUNDAY	15th OCT 2017	SUNDAY
MONDAY	16th OCT 2017	GROCERY DISTRIBUTION
TUESDAY	17th OCT 2017	CLASS WORK ACTIVITY
WEDNESDAY	18th OCT 2017	CLASS WORK ACTIVITY
THURSDAY	19th OCT 2017	DEEPAVALI
FRIDAY	20th OCT 2017	CLASS WORK ACTIVITY
SATURDAY	21th OCT 2017	CLASS WORK ACTIVITY
SUNDAY	22th OCT 2017	SUNDAY
MONDAY	23th OCT 2017	CLASS WORK ACTIVITY
TUESDAY	24th OCT 2017	CLASS WORK ACTIVITY
WEDNESDAY	25th OCT 2017	CLASS WORK ACTIVITY
THURSDAY	26th OCT 2017	CLASS WORK ACTIVITY
FRIDAY	27th OCT 2017	CLASS WORK ACTIVITY
SATURDAY	28th OCT 2017	CLASS WORK ACTIVITY
SUNDAY	29th OCT 2017	SUNDAY
MONDAY	30th OCT 2017	CLASS WORK ACTIVITY
TUESDAY	31th OCT 2017	NATIONAL UNITY DAY
WEDNESDAY	1st NOV 2017	CLASS WORK ACTIVITY
THURSDAY	2nd NOV 2017	TRAINING PROGRAMME ON MATLAB
FRIDAY	3rd NOV 2017	TRAINING PROGRAMME ON MATLAB
SATURDAY	4th NOV 2017	GURUNANAK/ KARTHIKA PURNAMI/ TRAINING PROGRAMME ON MATLAB
SUNDAY	5th NOV 2017	SUNDAY
MONDAY	6th NOV 2017	TRAINING PROGRAMME ON MATLAB
TUESDAY	7th NOV 2017	CLASS WORK ACTIVITY
WEDNESDAY	8th NOV 2017	SECOND MID TERM EXAM
THURSDAY	9th NOV 2017	SECOND MID TERM EXAM
FRIDAY	10th NOV 2017	SECOND MID TERM EXAM/ LAST DAY OF INSTRUCTIONS
SATURDAY	11th NOV 2017	SECOND SATURDAY

SUNDAY	12th NOV 2017	SUNDAY
MONDAY	13th NOV 2017	PREPARATION HOLIDAYS AND PRACTICAL EXAMS
TUESDAY	14th NOV 2017	PREPARATION HOLIDAYS AND PRACTICAL EXAMS
WEDNESDAY	15th NOV 2017	PREPARATION HOLIDAYS AND PRACTICAL EXAMS
THURSDAY	16th NOV 2017	PREPARATION HOLIDAYS AND PRACTICAL EXAMS
FRIDAY	17th NOV 2017	PREPARATION HOLIDAYS AND PRACTICAL EXAMS
SATURDAY	18th NOV 2017	PREPARATION HOLIDAYS AND PRACTICAL EXAMS/ SUBMISSION OF SECOND MID TERM EXAMS MARKSTO UNIVERSITY
SUNDAY	19th NOV 2017	SUNDAY
MONDAY	20th NOV 2017	END SEMESTER & SUPPLEMENTARY EXAMS II,III,IV YEAR-I SEM
TUESDAY	21th NOV 2017	END SEMESTER & SUPPLEMENTARY EXAMS II,III,IV YEAR-I SEM
WEDNESDAY	22th NOV2017	END SEMESTER & SUPPLEMENTARY EXAMS II,III,IV YEAR-I SEM
THURSDAY	23th NOV 2017	END SEMESTER & SUPPLEMENTARY EXAMS II,III,IV YEAR-I SEM / SECOND MID TERM EXAM FOR I YEAR -I SEM
FRIDAY	24th NOV 2017	END SEMESTER & SUPPLEMENTARY EXAMS II,III,IV YEAR-I SEM / SECOND MID TERM EXAM FOR I YEAR -I SEM
SATURDAY	25th NOV 2017	END SEMESTER & SUPPLEMENTARY EXAMS II,III,IV YEAR-I SEM / SECOND MID TERM EXAM FOR I YEAR -I SEM / LAST DAY INSTRUCTION FOR I YEAR -I SEM
SUNDAY	26th NOV 2017	SUNDAY
MONDAY	27th NOV 2017	END SEMESTER & SUPPLEMENTARY EXAMS II,III,IV YEAR-I SEM / PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR IYEAR- ISEM
TUESDAY	28th NOV 2017	END SEMESTER & SUPPLEMENTARY EXAMS II,III,IV YEAR-I SEM / PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR IYEAR- ISEM
WEDNESDAY	29th NOV 2017	END SEMESTER & SUPPLEMENTARY EXAMS II,III,IV YEAR-I SEM / PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR IYEAR- ISEM
THURSDAY	30th NOV 2017	END SEMESTER & SUPPLEMENTARY EXAMS II,III,IV YEAR-I SEM / PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR IYEAR- ISEM
FRIDAY	1st DEC 2017	END SEMESTER & SUPPLEMENTARY EXAMS II,III,IV YEAR-I SEM / PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR IYEAR- ISEM
SATURDAY	2nd DEC 2017	END SEMESTER & SUPPLEMENTARY EXAMS II,III,IV YEAR-I SEM / PREPARATION HOLIDAYS AND PRACTICAL EXAM FOR IYEAR- ISEM
SUNDAY	3rd DEC 2017	SUNDAY
MONDAY	4th DEC 2017	END SEMESTER & SUPPLEMENTARY EXAMS I, II,III,IV YEAR-I SEM
TUESDAY	5th DEC 2017	END SEMESTER & SUPPLEMENTARY EXAMS I, II,III,IV YEAR-I SEM
WEDNESDAY	6th DEC 2017	END SEMESTER & SUPPLEMENTARY EXAMS I, II,III,IV YEAR-I SEM
THURSDAY	7th DEC 2017	END SEMESTER & SUPPLEMENTARY EXAMS I, II,III,IV YEAR-I SEM
FRIDAY	8th DEC 2017	END SEMESTER & SUPPLEMENTARY EXAMS I, II,III,IV YEAR-I SEM / SUBMISSION OF SECOND MID TERM EXAM MARKS TO UNIVERSITY OF I YEAR-ISEM
SATURDAY	9th DEC 2017	SECOND SATURDAY
SUNDAY	10th DEC 2017	SUNDAY
MONDAY	11th DEC 2017	END SEMESTER & SUPPLEMENTARY EXAMS I, II,III,IV YEAR-I SEM
TUESDAY	12th DEC 2017	END SEMESTER & SUPPLEMENTARY EXAMS I, II,III,IV YEAR-I SEM
WEDNESDAY	13th DEC 2017	END SEMESTER & SUPPLEMENTARY EXAMS I, II,III,IV YEAR-I SEM
THURSDAY	14th DEC 2017	COMMENCEMENT OF INSTRUCTION II,III,IV YEAR-II SEM / END SEMESTER EXAM I YEAR I SEM
FRIDAY	15th DEC 2017	END SEMESTER EXAMS I YEAR-I SEM
SATURDAY	16th DEC 2017	END SEMESTER EXAMS I YEAR-I SEM
SUNDAY	17th DEC 2017	SUNDAY
MONDAY	18th DEC 2017	COMMENCEMENT OF INSTRUCTION FOR IYEAR -II SEM
TUESDAY	19th DEC 2017	CLASS WORK ACTIVITY
WEDNESDAY	20th DEC 2017	CLASS WORK ACTIVITY

THURSDAY	21th DEC 2017	CLASS WORK ACTIVITY
FRIDAY	22th DEC 2017	CLASS WORK ACTIVITY
SATURDAY	23th DEC 2017	CLASS WORK ACTIVITY
SUNDAY	24th DEC 2017	SUNDAY
MONDAY	25th DEC 2017	CHIRSTMAS
TUESDAY	26th DEC 2017	BOXING DAY
WEDNESDAY	27th DEC 2017	CLASS WORK ACTIVITY
THURSDAY	28th DEC 2017	CLASS WORK ACTIVITY
FRIDAY	29th DEC 2017	CLASS WORK ACTIVITY
SATURDAY	30th DEC 2017	CLASS WORK ACTIVITY
SUNDAY	31th DEC 2017	SUNDAY
MONDAY	1st JAN 2018	NEW YEAR
TUESDAY	2nd JAN 2018	CLASS WORK ACTIVITY
WEDNESDAY	3rd JAN 2018	CLASS WORK ACTIVITY
THURSDAY	4th JAN 2018	CLASS WORK ACTIVITY
FRIDAY	5th JAN 2018	CLASS WORK ACTIVITY
SATURDAY	6th JAN 2018	CLASS WORK ACTIVITY
SUNDAY	7th JAN 2018	SUNDAY
MONDAY	8th JAN 2018	CLASS WORK ACTIVITY
TUESDAY	9th JAN 2018	CLASS WORK ACTIVITY
WEDNESDAY	10th JAN 2018	CLASS WORK ACTIVITY
THURSDAY	11th JAN 2018	CLASS WORK ACTIVITY
FRIDAY	12th JAN 2018	NATIONAL YOUTH DAY
SATURDAY	13th JAN 2018	SECOND SATURDAY
SUNDAY	14th JAN 2018	SUNDAY/SANKRANTHI
MONDAY	15th JAN 2018	CLASS WORK ACTIVITY
TUESDAY	16th JAN 2018	CLASS WORK ACTIVITY
WEDNESDAY	17th JAN 2018	CLASS WORK ACTIVITY
THURSDAY	18th JAN 2018	CLASS WORK ACTIVITY
FRIDAY	19th JAN 2018	CLASS WORK ACTIVITY
SATURDAY	20th JAN 2018	
SUNDAY	21th JAN 2018	SUNDAY
MONDAY	22thJAN 2018	CLASS WORK ACTIVITY
TUESDAY	23th JAN 2018	CLASS WORK ACTIVITY
WEDNESDAY	24th JAN 2018	CLASS WORK ACTIVITY
THURSDAY	25th JAN 2018	CLASS WORK ACTIVITY
FRIDAY	26th JAN 2018	REPUBLIC DAY
SATURDAY	27th JAN 2018	CLASS WORK ACTIVITY

SUNDAY	28th JAN 2018	SUNDAY
MONDAY	29th JAN 2018	
TUESDAY	30th JAN 2018	
WEDNESDAY	31th JAN 2018	
THURSDAY	1st FEB 2018	
FRIDAY	2nd FEB 2018	
SATURDAY	3rd FEB 2018	CLASS WORK ACTIVITY
SUNDAY	4th FEB 2018	SUNDAY
MONDAY	5th FEB 2018	CLASS WORK ACTIVITY
TUESDAY	6th FEB 2018	CLASS WORK ACTIVITY
WEDNESDAY	7th FEB 2018	FIRST MID TERM EXAM I,II,III,IV YEAR-II SEM
THURSDAY	8th FEB 2018	FIRST MID TERM EXAM I,II,III,IV YEAR-II SEM
FRIDAY	9th FEB 2018	FIRST MID TERM EXAM I,II,III,IV YEAR-II SEM
SATURDAY	10th FEB 2018	SECOND SATURDAY / PARENT TEACHERS MEETING I,II,III,IV YEAR -II SEM
SUNDAY	11th FEB 2018	SUNDAY
MONDAY	12th FEB 2018	CLASS WORK ACTIVITY
TUESDAY	13th FEB 2018	MAHA SHIVARATHRI
WEDNESDAY	14th FEB 2018	CLASS WORK ACTIVITY
THURSDAY	15th FEB 2018	CLASS WORK ACTIVITY
FRIDAY	16th FEB 2018	
SATURDAY	17th FEB 2018	SUBMISSION OF FIRST MID TERM EXAM MARKS TO UNIVERSITY OF I, II,III,IV YEAR -II SEM
SUNDAY	18th FEB 2018	SUNDAY
MONDAY	19th FEB 2018	CLASS WORK ACTIVITY
TUESDAY	20th FEB 2018	CLASS WORK ACTIVITY
WEDNESDAY	21th FEB 2018	CLASS WORK ACTIVITY
THURSDAY	22th FEB 2018	CLASS WORK ACTIVITY
FRIDAY	23th FEB 2018	CLASS WORK ACTIVITY
SATURDAY	24th FEB 2018	CLASS WORK ACTIVITY
SUNDAY	25th FEB 2018	SUNDAY
MONDAY	26th FEB 2018	CLASS WORK ACTIVITY
TUESDAY	27th FEB 2018	CLASS WORK ACTIVITY
WEDNESDAY	28th FEB 2018	CLASS WORK ACTIVITY
THURSDAY	1st MAR 2018	HOLI
FRIDAY	2nd MAR 2018	CLASS WORK ACTIVITY
SATURDAY	3rd MAR 2018	HOLIDAY
SUNDAY	4th MAR 2018	SUNDAY
MONDAY	5th MAR 2018	CLASS WORK ACTIVITY
TUESDAY	6th MAR 2018	CLASS WORK ACTIVITY
WEDNESDAY	7th MAR 2018	Advancement in current trends
THURSDAY	8th MAR 2018	INTERNATIONAL WOMENS DAY
FRIDAY	9th MAR 2018	CLASS WORK ACTIVITY
SATURDAY	10th MAR 2018	SECOND SATURDAY/PARENTS TEACHER MEETING
SUNDAY	11th MAR 2018	SUNDAY
MONDAY	12th MAR 2018	

TUESDAY	13th MAR 2018	CLASS WORK ACTIVITY
WEDNESDAY	14th MAR 2018	CLASS WORK ACTIVITY
THURSDAY	15th MAR 2018	CLASS WORK ACTIVITY
FRIDAY	16th MAR 2018	CLASS WORK ACTIVITY
SATURDAY	17th MAR 2018	CLASS WORK ACTIVITY
SUNDAY	18th MAR 2018	SUNDAY /UGADI
MONDAY	19th MAR 2018	CLASS WORK ACTIVITY
TUESDAY	20th MAR 2018	CLASS WORK ACTIVITY
WEDNESDAY	21th MAR 2018	
THURSDAY	22TH MAR 2018	CLASS WORK ACTIVITY
FRIDAY	23th MAR 2018	CLASS WORK ACTIVITY
SATURDAY	24th MAR 2018	CLASS WORK ACTIVITY
SUNDAY	25th MAR 2018	SUNDAY
MONDAY	26th MAR 2018	SRI RAMA NAVAMI
TUESDAY	27th MAR 2018	CLASS WORK ACTIVITY
WEDNESDAY	28th MAR 2018	CLASS WORK ACTIVITY
THURSDAY	29th MAR 2018	CLASS WORK ACTIVITY
FRIDAY	30th MAR 2018	GOOD FRIDAY
SATURDAY	31th MAR 2018	CLASS WORK ACTIVITY
SUNDAY	1st APR 2018	SUNDAY
MONDAY	2nd APR 2018	BABU JAGJIVAN RAM JAYANTHI
TUESDAY	3rd APR 2018	CLASS WORK ACTIVITY
WEDNESDAY	4th APR 2018	SECOND MID TERM EXAMS I, II,III,IVYEAR-II SEM
THURSDAY	5th APR 2018	SECOND MID TERM EXAMS I, II,III,IVYEAR-II SEM
FRIDAY	6th APR 2018	SECOND MID TERM EXAMS I, II,III,IVYEAR-II SEM
SATURDAY	7th APR 2018	SECOND MID TERM EXAMS I, II,III,IVYEAR-II SEM/LAST DAY INSTRUCTION I,II,III,IV -II SEM
SUNDAY	8th APR 2018	SUNDAY
MONDAY	9th APR 2018	PREPARATION HOLIDAYS &PRACTICAL EXAMS FOR I,II,III,IV YEAR - II SEM
TUESDAY	10th APR 2018	PREPARATION HOLIDAYS &PRACTICAL EXAMS FOR I,II,III,IV YEAR - II SEM
WEDNESDAY	11th AP0R 2018	PREPARATION HOLIDAYS &PRACTICAL EXAMS FOR I,II,III,IV YEAR - II SEM
THURSDAY	12th APR 2018	PREPARATION HOLIDAYS &PRACTICAL EXAMS FOR I,II,III,IV YEAR - II SEM
FRIDAY	13th APR 2018	PREPARATION HOLIDAYS & PRACTICAL EXAMS FOR I,II,III,IV YEAR -II SEM / SUBMISSION OF SECOND MID TERM EXAM MARKS TO UNIVERSITY I,II,III,IV YEAR -II SEM
SATURDAY	14th APR 2018	Dr. B R AMBEDKAR JAYATHI
SUNDAY	15th APR 2018	SUNDAY /SHAB-E-MORAI
MONDAY	16th APR 2018	END SEMESTER &SUPPLEMENTARY EXAM I,II,III,IV YEAR-II SEM
TUESDAY	17th APR 2018	END SEMESTER &SUPPLEMENTARY EXAM I,II,III,IV YEAR-II SEM
WEDNESDAY	18th APR 2018	END SEMESTER &SUPPLEMENTARY EXAM I,II,III,IV YEAR-II SEM
THURSDAY	19th APR 2018	END SEMESTER &SUPPLEMENTARY EXAM I,II,III,IV YEAR-II SEM
FRIDAY	20th APR 2018	END SEMESTER &SUPPLEMENTARY EXAM I,II,III,IV YEAR-II SEM
SATURDAY	21th APR 2018	END SEMESTER &SUPPLEMENTARY EXAM I,II,III,IV YEAR-II SEM / WORLD EARTH DAY
SUNDAY	22th APR 2018	SUNDAY
MONDAY	23th APR 2018	END SEMESTER &SUPPLEMENTARY EXAM I,II,III,IV YEAR-II SEM

TUESDAY	24th APR 2018	END SEMESTER &SUPPLEMENTARY EXAM I,II,III,IV YEAR-II SEM
WEDNESDAY	25th APR 2018	END SEMESTER &SUPPLEMENTARY EXAM I,II,III,IV YEAR-II SEM
THURSDAY	26th APR 2018	END SEMESTER &SUPPLEMENTARY EXAM I,II,III,IV YEAR-II SEM
FRIDAY	27th APR 2018	END SEMESTER &SUPPLEMENTARY EXAM I,II,III,IV YEAR-II SEM
SATURDAY	28th APR 2018	END SEMESTER &SUPPLEMENTARY EXAM I,II,III,IV YEAR-II SEM
SUNDAY	29th APR 2018	SUNDAY/ BUDDU POORNEMA
MONDAY	30th APR 2018	END SEMESTER &SUPPLEMENTARY EXAM I, II,III,IV YEAR-II SEM
TUESDAY	1st MAY 2018	END SEMESTER &SUPPLEMENTARY EXAM I, II,III,IV YEAR-II SEM
WEDNESDAY	2nd MAY 2018	END SEMESTER &SUPPLEMENTARY EXAM I, II,III,IV YEAR-II SEM
THURSDAY	3rd MAY 2018	END SEMESTER &SUPPLEMENTARY EXAM I, II,III,IV YEAR-II SEM
FRIDAY	4th MAY 2018	END SEMESTER &SUPPLEMENTARY EXAM I, II,III,IV YEAR-II SEM
SATURDAY	5th MAY 2018	END SEMESTER &SUPPLEMENTARY EXAM I, II,III,IV YEAR-II SEM
SUNDAY	6th MAY 2018	SUNDAY
MONDAY	7th MAY 2018	END SEMESTER &SUPPLEMENTARY EXAM I, II,III,IV YEAR-II SEM
TUESDAY	8th MAY 2018	SUMMAR VACATION II,III,IV YEAR
WEDNESDAY	9th MAY 2018	SUMMAR VACATION II,III,IV YEAR
THURSDAY	10th MAY 2018	SUMMAR VACATION II,III,IV YEAR
FRIDAY	11th MAY 2018	SUMMAR VACATION II,III,IV YEAR
SATURDAY	12th MAY 2018	SECOND SATURDAY
SUNDAY	13th MAY 2018	SUNDAY
MONDAY	14th MAY 2018	SUMMAR VACATION II,III,IV YEAR
TUESDAY	15th MAY 2018	SUMMAR VACATION II,III,IV YEAR
WEDNESDAY	16th MAY 2018	SUMMAR VACATION II,III,IV YEAR
THURSDAY	17th MAY 2018	SUMMAR VACATION II,III,IV YEAR
FRIDAY	18th MAY 2018	SUMMAR VACATION II,III,IV YEAR
SATURDAY	19th MAY 2018	SUMMAR VACATION II,III,IV YEAR
SUNDAY	20th MAY 2018	SUNDAY
MONDAY	21th MAY 2018	SUMMAR VACATION II,III,IV YEAR
TUESDAY	22th MAY 2018	SUMMAR VACATION II,III,IV YEAR
WEDNESDAY	23th MAY 2018	SUMMAR VACATION II,III,IV YEAR
THURSDAY	24th MAY 2018	SUMMAR VACATION II,III,IV YEAR
FRIDAY	25th MAY 2018	SUMMAR VACATION II,III,IV YEAR
SATURDAY	26th MAY 2018	SUMMAR VACATION II,III,IV YEAR
SUNDAY	27th MAY 2018	SUNDAY
MONDAY	28th MAY 2018	SUMMAR VACATION II,III,IV YEAR
TUESDAY	29th MAY 2018	SUMMAR VACATION II,III,IV YEAR
WEDNESDAY	30th MAY 2018	SUMMAR VACATION II,III,IV YEAR
THURSDAY	31th MAY 2018	SUMMAR VACATION II,III,IV YEAR
FRIDAY	1st JUN 2018	SUMMAR VACATION II,III,IV YEAR
SATURDAY	2nd JUN 2018	SUMMAR VACATION II,III,IV YEAR
SUNDAY	3rd JUN 2018	SUNDAY
MONDAY	4th JUN 2018	SUMMAR VACATION II,III,IV YEAR
TUESDAY	5th JUN 2018	SUMMAR VACATION II,III,IV YEAR

WEDNESDAY	6th JUN 2018	SUMMAR VACATION II,III,IV YEAR
THURSDAY	7th JUN 2018	SUMMAR VACATION II,III,IV YEAR
FRIDAY	8th JUN 2018	SUMMAR VACATION II,III,IV YEAR
SATURDAY	9th JUN 2018	SECOND SATURDAY
SUNDAY	10th JUN 2018	SUNDAY
MONDAY	11th JUN 2018	SUMMAR VACATION II,III,IV YEAR
TUESDAY	12th JUN 2018	SUMMAR VACATION II,III,IV YEAR
WEDNESDAY	13th JUN 2018	SUMMAR VACATION II,III,IV YEAR
THURSDAY	14th JUN 2018	SUMMAR VACATION II,III,IV YEAR
FRIDAY	15th JUN 2018	SUMMAR VACATION II,III,IV YEAR
SATURDAY	16th JUN 2018	RAMZAN
SUNDAY	17th JUN 2018	SUNDAY
MONDAY	18th JUN 2018	SUMMAR VACATION II,III,IV YEAR
TUESDAY	19th JUN 2018	SUMMAR VACATION II,III,IV YEAR
WEDNESDAY	20th JUN 2018	SUMMAR VACATION II,III,IV YEAR
THURSDAY	21th JUN 2018	SUMMAR VACATION II,III,IV YEAR
FRIDAY	22th JUN 2018	SUMMAR VACATION II,III,IV YEAR/ YOGA DAY
SATURDAY	23th JUN 2018	SUMMAR VACATION II,III,IV YEAR
SUNDAY	24th JUN 2018	SUNDAY
MONDAY	25th JUN 2018	SUMMAR VACATION II,III,IV YEAR
TUESDAY	26th JUN 2018	SUMMAR VACATION II,III,IV YEAR
WEDNESDAY	27th JUN 2018	SUMMAR VACATION II,III,IV YEAR
THURSDAY	28th JUN 2018	SUMMAR VACATION II,III,IV YEAR
FRIDAY	29th JUN 2018	SUMMAR VACATION II,III,IV YEAR
SATURDAY	30th JUN 2018	SUMMAR VACATION II,III,IV YEAR
SUNDAY	1st JULY 2018	SUNDAY
MONDAY	2nd JULY 2018	SUMMAR VACATION II,III,IV YEAR
TUESDAY	3rd JULY 2018	SUMMAR VACATION II,III,IV YEAR
WEDNESDAY	4th JULY 2018	SUMMAR VACATION II,III,IV YEAR
THURSDAY	5th JULY 2018	SUMMAR VACATION II,III,IV YEAR
FRIDAY	6th JULY 2018	SUMMAR VACATION II,III,IV YEAR
SATURDAY	7th JULY 2018	SUMMAR VACATION II,III,IV YEAR
SUNDAY	8th JULY 2018	SUNDAY

PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. PHARMACY I YEAR COURSE STRUCTURE AND SYLLABUS

Effective from Academic Year 2017-18 Admitted Batch

I Year I semester

S. No	Course Code	Subject	L	T	P	Credits
1	PS101	Human Anatomy and Physiology I	3	1	-	3
2	PS102	Pharmaceutical Analysis I	3	1	-	3
3	PS103	Pharmaceutics I	3	1	-	3
4	PS104	Pharmaceutical Inorganic Chemistry-I	3	1	-	3
5	HS105	Communication skills	2	-	-	2
6	BS106/BS107	Remedial Biology[#] / Remedial Mathematics[$]	2[#]/3[$]	-	-	2[#]/3[$]
7	PS108	Human Anatomy and Physiology-I lab	-	-	4	2
8	PS109	Pharmaceutical Analysis-I lab	-	-	4	2
9	PS110	Pharmaceutics I lab	-	-	4	2
10	PS111	Pharmaceutical Inorganic Chemistry-I lab	-	-	4	2
11	HS112	Communication skills lab	-	-	2	1
12	BS113	Remedial Biology lab	-	-	2	1
		Total	**16/17**	**4**	**20**	**26[#]/26[$]**

[#]Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB) course**.**

[$]Applicable ONLY for the students who have studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM) course**.**

I Year II semester

S. No	Course Code	Subject	L	T	P	Credits
1	PS201	Human Anatomy and Physiology II	3	1	-	3
2	PS202	Pharmaceutical Organic Chemistry I	4	1	-	4
3	BS203	Biochemistry	3	1	-	3
4	BS204	Pathophysiology	3	1	-	3
5	CS205	Computer Applications in Pharmacy	3	-	-	3
6	PS206	Human Anatomy and Physiology II lab	-	-	4	2
7	PS207	Pharmaceutical Organic Chemistry I lab	-	-	4	2
8	BS208	Biochemistry lab	-	-	4	2
9	CS209	Computer Applications in Pharmacy lab	-	-	2	1
10	*MC200	NSS	-	-	-	-
		Total	**16**	**4**	**14**	**23**

*MC - Mandatory Course - Satisfactory/ Unsatisfactory.

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PS101: HUMAN ANATOMY AND PHYSIOLOGY- I

B. Pharm. I Year I Sem

L	T	P	C
3	1	0	3

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Course Objectives: Upon completion of this course the student should be able to

- Explain the gross morphology, structure, and functions of various organs of the human body.
- Describe the various homeostatic mechanisms and their imbalances.
- Identify the various tissues and organs of different systems of human body.
- Perform the various experiments related to special senses and nervous system.
- Appreciate coordinated working pattern of different organs of each system

Unit – I 10 hours

Introduction to human body

Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology.

Cellular level of organization

Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine

Tissue level of organization

Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

Unit – II 10 hours

Integumentary system Structure and functions of skin

Skeletal system

Divisions of skeletal system, types of bone, salient features, and functions of bones of axial and appendicular skeletal system

Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction

Joints

Structural and functional classification, types of joints movements and its articulation

Unit – III 10 hours

Nervous system

Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.

Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity)

Unit – IV 08 hours

Peripheral nervous system:

Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves.

Special senses

Structure and functions of eye, ear, nose and tongue and their disorders.

Unit – V 07 hours

Endocrine system

Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.

TEXTBOOKS: (Latest Editions)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, River view, MI USA
4. Text book of Medical Physiology- Arthur C, Guytonand John. E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

REFERENCE BOOKS: (Latest Editions)

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata

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PS102: PHARMACEUTICAL ANALYSIS - I

B. Pharm. I Year I Sem

L	T	P	C
3	1	0	3

Scope: This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs

Course Objectives: Upon completion of the course student shall be able to

- understand the principles of volumetric and electro chemical analysis
- carryout various volumetric and electrochemical titrations
- develop analytical skills

UNIT- I 10 Hours

(a) Pharmaceutical analysis- Definition and scope

i) Different techniques of analysis

ii) Methods of expressing concentration

iii) Primary and secondary standards.

iv) Preparation and standardization of various molar and normal solutions-Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate

(b) Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures

UNIT- II10 Hours

Acid base titration: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves

Non aqueous titration: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

UNIT- III 10 Hours

Precipitation titrations: Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride.

Complexometric titration: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.

Gravimetry: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.

UNIT - IV 08 Hours

Redox titrations:

(a) Concepts of oxidation and reduction

(b) Types of redox titrations (Principles and applications)

Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate

UNIT - V 7 Hours

Electrochemical methods of analysis:

Conductometry - Introduction, Conductivity cell, Conductometric titrations, applications.

Potentiometry - Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.

Polarography - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications

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TEXTBOOKS: (Latest Editions)

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. GunduRao, Inorganic Pharmaceutical Chemistry
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry
5. John H. Kennedy, Analytical chemistry principles
6. Indian Pharmacopoeia.

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PS103: PHARMACEUTICS - I

B. Pharm. I Year I Sem

L	T	P	C
3	1	0	3

Scope: This course is designed to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms.

Course Objectives: Upon completion of this course the student should be able to:

- Know the history of profession of pharmacy
- Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
- Understand the professional way of handling the prescription
- Preparation of various conventional dosage forms

UNIT – I 10 Hours

Historical background and development of profession of pharmacy: History of profession of Pharmacy in India in relation to pharmacy education, industry, and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.

Dosage forms: Introduction to dosage forms, classification and definitions

Prescription: Definition, Parts of prescription, handling of Prescription and Errors in prescription.

Posology: Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

UNIT – II 10 Hours

Pharmaceutical calculations: Weights and measures–Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.

Powders: Definition, classification, advantages and disadvantages, Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.

Liquid dosage forms: Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques

UNIT – III 08 Hours

Monophasic liquids: Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.

Biphasic liquids:

Suspensions: Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome.

Emulsions: Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.

UNIT – IV 08 Hours

Suppositories: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.

Pharmaceutical incompatibilities: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

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UNIV – V 07 Hours

Semisolid dosage forms: Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosages forms

TEXTBOOKS: (Latest Editions)

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
3. M.E. Aulton, Pharmaceutics, The Science& Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Indian pharmacopoeia.
5. British pharmacopoeia.
6. Lachmann. Theory and Practice of Industrial Pharmacy, Lea & Febiger Publisher, The University of Michigan.
7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
8. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.
9. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.
10. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.
11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.
12. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.

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PS104: PHARMACEUTICAL INORGANIC CHEMISTRY - I

B. Pharm. I Year I Sem

L	T	P	C
3	1	0	3

Scope: This subject deals with the monographs of inorganic drugs and pharmaceuticals.

Course Objectives: Upon completion of course student shall be able to

- know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
- understand the medicinal and pharmaceutical importance of inorganic compounds

UNIT – I 10 Hours

Impurities in pharmaceutical substances: History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate

General methods of preparation, assay for the compounds superscripted with **asterisk (*),** properties and medicinal uses of inorganic compounds belonging to the following classes

UNIT – II 10 Hours

Acids, Bases and Buffers: Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.

Major extra and intracellular electrolytes: Functions of major Physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance.

Dental products: Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.

UNIT – III 10 Hours

Gastrointestinal agents

Acidifiers: Ammonium chloride* and Dil. HCl

Antacid: Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture

Cathartics: Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite

Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations

UNIT – IV 08 Hours

Miscellaneous compounds

Expectorants: Potassium iodide, Ammonium chloride*.

Emetics: Copper sulphate*, Sodium potassium tartarate

Haematinics: Ferrous sulphate*, Ferrous gluconate

Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodiumnitrite 333

Astringents: Zinc Sulphate, Potash Alum

UNIT – V 07 Hours

Radiopharmaceuticals: Radio activity, Measurement of radioactivity, Properties of á, â, ã radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide I^{131}, Storage conditions, precautions & pharmaceutical application of radioactive substances.

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TEXTBOOKS: (Latest Editions)

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4th edition.
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. GunduRao, Inorganic Pharmaceutical Chemistry, 3rd Edition
4. M.L Schroff, Inorganic Pharmaceutical Chemistry
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry
6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry
7. Indian Pharmacopoeia

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HS105: COMMUNICATION SKILLS

B. Pharm. I Year I Sem

L	T	P	C
2	0	0	2

Scope: This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

Course Objectives: Upon completion of the course the student shall be able to

- Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
- Communicate effectively (Verbal and Non Verbal)
- Effectively manage the team as a team player
- Develop interview skills
- Develop Leadership qualities and essentials

UNIT – I 07 Hours

Communication Skills: Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context

Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers

Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment

UNIT – II 07 Hours

Elements of Communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication

Communication Styles: Introduction, The Communication Styles Matrix with example for each - Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

UNIT – III 07 Hours

Basic Listening Skills: Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations

Effective Written Communication: Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication

Writing Effectively: Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message

UNIT – IV 05 Hours

Interview Skills: Purpose of an interview, Do's and Dont's of an interview

Giving Presentations: Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

UNIT – V 04 Hours

Group Discussion: Introduction, Communication skills in group discussion, Do's and Dont's of group discussion

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Recommended Books: (Latest Edition)

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1st Edition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1st Edition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5th Edition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konarnira, 2nd Edition, New arrivals – PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1st Edition, Oxford Press, 2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning India pvt. ltd, 2011
10. Soft skills and professional communication, Francis Peters SJ, 1st Edition, McGraw Hill Education, 2011
11. Effective communication, John Adair, 4th Edition, Pan Mac Millan, 2009
12. Bringing out the best in people, Aubrey Daniels, 2nd Edition, McGraw Hill, 1999

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BS106: REMEDIAL BIOLOGY

B. Pharm. I Year I Sem

L	T	P	C
2	0	0	2

Scope: To learn and understand the components of living world, structure and functional system of plant and animal kingdom.

Course Objectives: Upon completion of the course, the student shall be able to

- know the classification and salient features of five kingdoms of life
- understand the basic components of anatomy & physiology of plant
- know understand the basic components of anatomy & physiology animal with special reference to human

UNIT - I 07 Hours

Living world:

- Definition and characters of living organisms
- Diversity in the living world
- Binomial nomenclature
- Five kingdoms of life and basis of classification. Salient features of Monera, Potista, Fungi, Animalia and Plantae, Virus,

Morphology of Flowering plants

Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed. General Anatomy of Root, stem, leaf of monocotyledons & Dicotylidones.

UNIT – II 07 Hours

Body fluids and circulation

Composition of blood, blood groups, coagulation of blood, Composition and functions of lymph Human circulatory system, Structure of human heart and blood vessels, Cardiac cycle, cardiac output and ECG

Digestion and Absorption

Human alimentary canal and digestive glands, Role of digestive enzymes, Digestion, absorption and assimilation of digested food

Breathing and respiration

Human respiratory system, Mechanism of breathing and its regulation, Exchange of gases, transport of gases and regulation of respiration, Respiratory volumes

UNIT – III 07 Hours

Excretory products and their elimination

Modes of excretion, Human excretory system- structure and function, Urine formation, Rennin angiotensin system

Neural control and coordination

Definition and classification of nervous system, Structure of a neuron, Generation, and conduction of nerve impulse, Structure of brain and spinal cord, Functions of cerebrum, cerebellum, hypothalamus, and medulla oblongata

Chemical coordination and regulation

Endocrine glands and their secretions, Functions of hormones secreted by endocrine glands

Human reproduction

Parts of female reproductive system, Parts of male reproductive system, Spermatogenesis and Oogenesis, Menstrual cycle

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UNIT – IV 05 Hours

Plants and mineral nutrition:

Essential mineral, macro and micronutrients, Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation

Photosynthesis:

Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.

UNIT – V 04 Hours

Plant respiration: Respiration, glycolysis, fermentation (anaerobic).

Plant growth and development

Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators

Cell - The unit of life

Structure and functions of cell and cell organelles. Cell division

Tissues

Definition, types of tissues, location and functions.

TEXT BOOKS:

1. Text book of Biology by S. B. Gokhale
2. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.

REFERENCE BOOKS:

1. Text book of Biology by B. V. Sreenivasa Naidu
2. A Text book of Biology by Naidu and Murthy
3. Botany for Degree students By A.C.Dutta.
4. Outlines of Zoology by M. Ekambaranatha ayyer and T. N. Anantha krishnan.
5. A manual for pharmaceutical biology practical by S. B. Gokhale and C. K. Kokate

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BS107: REMEDIAL MATHEMATICS

B. Pharm. I Year I Sem

L	T	P	C
3	0	0	3

Scope: This is an introductory course in mathematics. This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform.

Course Objectives: Upon completion of the course the student shall be able to:-

- Know the theory and their application in Pharmacy
- Solve the different types of problems by applying theory
- Appreciate the important application of mathematics in Pharmacy

UNIT – I 06 Hours

Partial fraction

Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction , Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics

Logarithms

Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.

Function*:*

Real Valued function, Classification of real valued functions,

Limits and continuity:

Introduction , Limit of a function, Definition of limit of a function (- sin definition) , lim $\frac{x^n - a^n}{x - a} = na^{n-1}$, lim $\frac{\sin}{} = 1$,

$x \to a$ $\theta \to 0$

UNIT- II 06 Hours

Matrices and Determinant:

Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations

UNIT – III 06 Hours

Calculus

Differentiation : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function , Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – **Without Proof**, Derivative of x^n *w.r.t* x, where *n* is any rational number, Derivative of e^x,, Derivative of $\log_e x$, Derivative of a^x, Derivative of trigonometric functions from first principles **(without Proof)**, Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application

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UNIT – IV 06 Hours

Analytical Geometry

Introduction: Signs of the Coordinates, Distance formula,

Straight Line : Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line

Integration:

Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application

UNIT – V 06 Hours

Differential Equations : Some basic definitions, Order and degree, Equations in separable form , Homogeneous equations, Linear Differential equations, Exact equations**,** Application in solving Pharmacokinetic equations

Laplace Transform : Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, Application in solving Chemical kinetics and Pharmacokinetics equations

TEXTBOOKS: (Latest Edition)

1. Differential Calculus by Shanthinarayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.
3. Integral Calculus by Shanthinarayan
4. Higher Engineering Mathematics by Dr. B.S. Grewal

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PS108: HUMAN ANATOMY AND PHYSIOLOGY - I Lab

B. Pharm. I Year I Sem

L	T	P	C
0	0	4	2

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals, or normal human beings. This is helpful for developing an insight on the subject**.**

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones
6. To study the integumentary and special senses using specimen, models, etc.,
7. To study the nervous system using specimen, models, etc.,
8. To study the endocrine system using specimen, models, etc
9. To demonstrate the general neurological examination
10. To demonstrate the function of olfactory nerve
11. To examine the different types of taste.
12. To demonstrate the visual acuity
13. To demonstrate the reflex activity
14. Recording of body temperature
15. To demonstrate positive and negative feedback mechanism.

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PS109: PHARMACEUTICAL ANALYSIS - I lab

B. Pharm. I Year I Sem

L	T	P	C
0	0	4	2

1. **Preparation and standardization of**
    1) Sodium hydroxide
    2) Sulphuric acid
    3) Sodium thiosulfate
    4) Potassium permanganate
    5) Ceric ammonium sulphate

2. **Assay of the following compounds along with Standardization of Titrant**
    1) Ammonium chloride by acid base titration
    2) Ferrous sulphate by Cerimetry
    3) Copper sulphate by Iodometry
    4) Calcium gluconate by complexometry
    5) Hydrogen peroxide by Permanganometry
    6) Sodium benzoate by non-aqueous titration
    7) Sodium Chloride by precipitation titration

3. **Determination of Normality by electro-analytical methods**
    1) Conductometric titration of strong acid against strong base
    2) Conductometric titration of strong acid and weak acid against strong base
    3) Potentiometric titration of strong acid against strong base

PS110: PHARMACEUTICS - I LAB

B. Pharm. I Year I Sem

L	T	P	C
0	0	4	2

1. **Syrups**
   a) Syrup IP
   b) Paracetamol pediatric syrup

2. **Elixirs**
   a) Piperazine citrate elixir
   b) Paracetamol pediatric elixir

3. **Linctus** a) Simple Linctus BPC

4. **Solutions**
   a) Strong solution of ammonium acetate
   b) Cresol with soap solution

5. **Suspensions**
   a) Calamine lotion
   b) Magnesium Hydroxide mixture

5. **Emulsions**
   a) Turpentine Liniment
   b) Liquid paraffin emulsion

6. **Powders and Granules**
   a) ORS powder (WHO)
   b) Effervescent granules c)Dusting powder

7. **Suppositories**
   a) Glycero gelatin suppository
   b) Soap glycerin suppository

8. **Semisolids**
   a) Sulphur ointment
   b) Non staining iodine ointment with methyl salicylate
   c) Bentonite gel

9. **Gargles and Mouthwashes**
   a) Potassium chlorate gargle
   b) Chlorhexidine mouthwash

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PS111: PHARMACEUTICAL INORGANIC CHEMISTRY - LAB

B. Pharm. I Year I Sem

L	T	P	C
0	0	4	2

Limit tests for following ions
Limit test for Chlorides and Sulphates Modified limit test for Chlorides and Sulphates Limit test for Iron
Limit test for Heavy metals Limit test for Lead
Limit test for Arsenic

Identification test Magnesium hydroxide Ferrous sulphate Sodium bicarbonate Calcium gluconate Copper sulphate

Test for purity
Swelling power of Bentonite
Neutralizing capacity of aluminum hydroxide gel
Determination of potassium iodate and iodine in potassium Iodide

Preparation of inorganic pharmaceuticals
Boric acid
Potash alum
Ferrous sulphate

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HS112: COMMUNICATION SKILLS - LAB

B. Pharm. I Year I Sem

L	T	P	C
0	0	2	1

The following learning modules are to be conducted using wordsworth® English language lab software

Basic communication covering the following topics
Meeting People
Asking Questions
Making Friends
What did you do?
Do's and Dont's

Pronunciations covering the following topics
Pronunciation (Consonant Sounds)
Pronunciation and Nouns
Pronunciation (Vowel Sounds)

Advanced Learning
Listening Comprehension / Direct and Indirect Speech
Figures of Speech
Effective Communication
Writing Skills
Effective Writing
Interview Handling Skills
E-Mail etiquette
Presentation Skills

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BS113: REMEDIAL BIOLOGY LAB

B. Pharm. I Year I Sem

L	T	P	C
0	0	2	1

1. Introduction to experiments in biology
    a) Study of Microscope
    b) Section cutting techniques
    c) Mounting and staining
    d) Permanent slide preparation

2. Study of cell and its inclusions
3. Study of Stem, Root, Leaf and its modifications
4. Detailed study of frog by using computer models
5. Microscopic study and identification of tissues
6. Identification of bones
7. Determination of blood group
8. Determination of blood pressure
9. Determination of tidal volume

REFERENCE BOOKS:

1. Practical human anatomy and physiology. By S.R. Kale and R.R. Kale.
2. A Manual of pharmaceutical biology practical by S. B. Gokhale, C. K. Kokate and S. P. Shrivastava.
3. Biology practical manual according to National core curriculum .Biology forum of Karnataka. Prof .M. J. H. Shafi

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PS201: HUMAN ANATOMY AND PHYSIOLOGY - II

B. Pharm. I Year II Sem

L	T	P	C
3	1	0	3

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Course Objectives: Upon completion of this course the student should be able to:

- Explain the gross morphology, structure, and functions of various organs of the human body.
- Describe the various homeostatic mechanisms and their imbalances.
- Identify the various tissues and organs of different systems of human body.
- Perform the hematological tests like blood cell counts, hemoglobin estimation, bleeding/clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume.
- Appreciate coordinated working pattern of different organs of each system
- Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.

Unit – I 10 hours

Body fluids and blood

Body fluids, composition and functions of blood, hemopoeisis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system.

Lymphatic system

Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system

Unit – II 10 hours

Cardiovascular system

Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

Unit – III 06 hours

Digestive system

Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.

Respiratory system

Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration

Unit – IV 10 hours

Respiratory system

Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.

Urinary system

Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.

Unit – V 09 hours

Reproductive system

Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition

Introduction to genetics

Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance

TEXTBOOKS: (Latest Editions)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
4. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

REFERENCE BOOKS:

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata

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PS202: PHARMACEUTICAL ORGANIC CHEMISTRY – I

B. Pharm. I Year II Sem

L	T	P	C
4	1	0	4

Scope: This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.

Course Objectives: Upon completion of the course the student shall be able to

- write the structure, name and the type of isomerism of the organic compound
- write the reaction, name the reaction and orientation of reactions
- account for reactivity/stability of compounds,
- identify/confirm the identification of organic compound

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

UNIT-I 07 Hours

Classification, nomenclature, and isomerism Classification of Organic Compounds, Common and IUPAC systems of nomenclature of organic compounds, (up to 10 Carbons open chain and carbocyclic compounds), Structural isomerisms in organic compounds

UNIT-II 10 Hours

Alkanes*, Alkenes* and Conjugated dienes*

SP^3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, SP^2 hybridization in alkenes

E_1 and E_2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E_1 verses E_2 reactions, Factors affecting E_1 and E_2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.

Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement

UNIT-III 10 Hours

Alkyl halides*

SN_1 and SN_2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations.

SN_1 versus SN_2 reactions, Factors affecting SN_1 and SN_2 reactions

Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform.

Alcohols*- Qualitative tests, Structure and uses of Ethyl alcohol, chlorobutanol, Cetosterylalcohol, Benzyl alcohol, Glycerol, Propylene glycol

UNIT-IV 10 Hours

Carbonyl compounds* (Aldehydes and ketones)

Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.

UNIT-V 08 Hours

Carboxylic acids*

Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester

Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid

Aliphatic amines* - Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine

TEXTBOOKS: (Latest Editions)

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I. L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P. L. Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K. Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.
9. Reaction and reaction mechanism by Ahluwaliah / Chatwal.

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BS203: BIOCHEMISTRY

B. Pharm. I Year II Sem

L	T	P	C
3	1	0	3

Scope: Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

Course Objectives: Upon completion of course student shell able to

- Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
- Understand the metabolism of nutrient molecules in physiological and pathological conditions.
- Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

UNIT – I 10 Hours

Carbohydrate metabolism

Glycolysis – Pathway, energetics and significance Citric acid cycle- Pathway, energetics and significance

HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency

Glycogen metabolism Pathways and glycogen storage diseases (GSD) Gluconeogenesis- Pathway and its significance

Hormonal regulation of blood glucose level and Diabetes mellitus

Biological oxidation

Electron transport chain (ETC) and its mechanism. Oxidative phosphorylation & its mechanism and substrate level phosphorylation, Inhibitors ETC and oxidative phosphorylation/Uncouplers

UNIT - II 10 Hours

Lipid metabolism

â-Oxidation of saturated fatty acid (Palmitic acid)

Formation and utilization of ketone bodies; ketoacidosis De novo synthesis of fatty acids (Palmitic acid)

Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D

Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.

Amino acid metabolism

General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders

Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenyketonuria, Albinism, alkeptonuria, tyrosinemia)

Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline

Catabolism of heme; hyperbilirubinemia and jaundice

UNIT – III 10 Hours

Nucleic acid metabolism and genetic information transfer Biosynthesis of purine and pyrimidine nucleotides

Catabolism of purine nucleotides and Hyperuricemia and Gout disease Organization of mammalian genome

Structure of DNA and RNA and their functions DNA replication (semi conservative model) Transcription or RNA synthesis
Genetic code, Translation or Protein synthesis and inhibitors

UNIT – IV 08 Hours
Biomolecules
Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.
Bioenergetics
Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.
Energy rich compounds; classification; biological significances of ATP and cyclic AMP

UNIT – V 07 Hours
Enzymes
Introduction, properties, nomenclature, and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot)
Enzyme inhibitors with examples
Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation
Therapeutic and diagnostic applications of enzymes and isoenzymes Coenzymes –Structure and biochemical functions

TEXTBOOKS: **(Latest Editions)**

1. Principles of Biochemistry by Lehninger.
2. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
3. Biochemistry by Stryer.
4. Biochemistry by D. Satyanarayan and U.Chakrapani
5. Textbook of Biochemistry by Rama Rao.
6. Textbook of Biochemistry by Deb.
7. Outlines of Biochemistry by Conn and Stumpf
8. Practical Biochemistry by R.C. Gupta and S. Bhargavan.
9. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
10. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
11. Practical Biochemistry by Harold Varley.

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BS204: PATHOPHYSIOLOGY

B. Pharm. I Year II Sem

L	T	P	C
3	1	0	3

Scope: Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes. This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

Course Objectives: Upon completion of the subject student shall be able to–

- Describe the etiology and pathogenesis of the selected disease states;
- Name the signs and symptoms of the diseases; and
- Mention the complications of the diseases.

Unit – I 10 Hours

Basic principles of Cell injury and Adaptation:

Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury**,** Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage)**,**Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia)**,**Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance

Basic mechanism involved in the process of inflammation and repair:

Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of
WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis

Unit – II 10 Hours

Cardiovascular System:

Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis, and arteriosclerosis)

Respiratory system: Asthma, Chronic obstructive airways diseases.

Renal system: Acute and chronic renal failure

Unit - III 10 Hours

Haematological Diseases:

Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, hemophilia

Endocrine system: Diabetes, thyroid diseases, disorders of sex hormones

Nervous system: Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.

Gastrointestinal system: Peptic Ulcer

Unit – IV 8 Hours

Inflammatory bowel diseases, jaundice, hepatitis (A, B, C, D, E, F) alcoholic liver disease.

Disease of bones and joints: Rheumatoid arthritis, osteoporosis, and gout

Principles of cancer: classification, etiology and pathogenesis of cancer

Diseases of bones and joints: Rheumatoid Arthritis, Osteoporosis, Gout

Principles of Cancer: Classification, etiology and pathogenesis of Cancer

Unit – V 7 Hours

Infectious diseases: Meningitis, Typhoid, Leprosy, Tuberculosis Urinary tract infections

Sexually transmitted diseases: AIDS, Syphilis, Gonorrhea

TEXTBOOKS: (Latest Editions)

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins & Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2. Harsh Mohan; Text book of Pathology; 6th edition; India; Jaypee Publications; 2010.
3. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12th edition; New York; McGraw-Hill; 2011.
4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states;
5. William and Wilkins, Baltimore; 1991 [1990 printing].
6. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston; Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.
7. Guyton A, John .E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company; 2010.
8. Joseph Di Piro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014.
9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company; 1997.
10. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003.

RECOMMENDED JOURNALS:

1. The Journal of Pathology. ISSN: 1096-9896 (Online)
2. The American Journal of Pathology. ISSN: 0002-9440
3. Pathology. 1465-3931 (Online)
4. International Journal of Physiology, Pathophysiology and Pharmacology. ISSN: 1944-8171 (Online)
5. Indian Journal of Pathology and Microbiology. ISSN-0377-4929.

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CS205: COMPUTER APPLICATIONS IN PHARMACY

B. Pharm. I Year II Sem

L	T	P	C
3	0	0	3

Scope: This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.

Course Objectives: Upon completion of the course the student shall be able to

- know the various types of application of computers in pharmacy
- know the various types of databases
- know the various applications of databases in pharmacy

UNIT – I 06 hours

Number system: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement ,Two's complement method, binary multiplication, binary division

Concept of Information Systems and Software: **I**nformation gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

UNIT –II 06 Hours

Web technologies: Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products

Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database

UNIT – III 06 Hours

Application of computers in Pharmacy –Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology, and adherence monitoring

Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System

UNIT – IV 06 hours

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

UNIT-V 06 hours

Computers as data analysis in Preclinical development: Chromatographic dada analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMS)

TEXTBOOKS: (Latest edition):

1. Computer Application in Pharmacy – William E. Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C. Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)

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4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002

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PS206: HUMAN ANATOMY AND PHYSIOLOGY – II LAB

B. Pharm. I Year II Sem

L	T	P	C
0	0	4	2

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject**.**

1. Introduction to hemocytometry.
2. Enumeration of white blood cell (WBC) count
3. Enumeration of total red blood corpuscles (RBC) count
4. Determination of bleeding time
5. Determination of clotting time
6. Estimation of hemoglobin content
7. Determination of blood group.
8. Determination of erythrocyte sedimentation rate (ESR).
9. Determination of heart rate and pulse rate.
10. Recording of blood pressure.
11. Determination of tidal volume and vital capacity.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13. Recording of basal mass index .
14. Study of family planning devices and pregnancy diagnosis test.
15. Demonstration of total blood count by cell analyser
16. Permanent slides of vital organs and gonads.

PS207: PHARMACEUTICAL ORGANIC CHEMISTRY - I LAB

B. Pharm. I Year II Sem

L	T	P	C
0	0	4	2

1. Systematic qualitative analysis of unknown organic compounds like
    1. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
    2. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test
    3. Solubility test
    4. Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
    5. Melting point/Boiling point of organic compounds
    6. Identification of the unknown compound from the literature using melting point/ boiling point.
    7. Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.
    8. Minimum 5 unknown organic compounds to be analysed systematically.

2. Preparation of suitable solid derivatives from organic compounds
3. Construction of molecular models

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BS208: BIOCHEMISTRY LAB

B. Pharm. I Year II Sem

L	T	P	C
0	0	4	2

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)
2. Identification tests for Proteins (albumin and Casein)
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
4. Qualitative analysis of urine for abnormal constituents
5. Determination of blood creatinine
6. Determination of blood sugar
7. Determination of serum total cholesterol
8. Preparation of buffer solution and measurement of pH
9. Study of enzymatic hydrolysis of starch
10. Determination of Salivary amylase activity
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.

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CS209: COMPUTER APPLICATIONS IN PHARMACY LAB

B. Pharm. I Year II Sem

L	T	P	C
0	0	2	1

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3 Retrieve the information of a drug and its adverse effects using online tools
4 Creating mailing labels Using Label Wizard , generating label in MS WORD
5 Create a database in MS Access to store the patient information with the required fields Using access
6. Design a form in MS Access to view, add, delete and modify the patient record in the database
7. Generating report and printing the report from patient database
8. Creating invoice table using – MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. PHARMACY II YEAR SYLLABUS (R17)

Effective from Academic Year 2017-18 Admitted Batch

II YEAR I SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	PS301	Pharmaceutical Organic Chemistry-II	3	1	0	4
2	PS302	Physical Pharmaceutics-I	3	1	0	4
3	BS303	Pharmaceutical Microbiology	3	1	0	4
4	PC304	Pharmaceutical Engineering	3	1	0	4
5	PS305	Pharmaceutical Organic Chemistry-II Lab	0	0	4	2
6	PS306	Physical Pharmaceutics-I Lab	0	0	4	2
7	BS307	Pharmaceutical Microbiology Lab	0	0	4	2
8	PC308	Pharmaceutical Engineering Lab	0	0	4	2
9	*MC300	NSO	0	0	0	0
		Total Credits	**12**	**04**	**17**	**24**

II YEAR II SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	PS401	Pharmaceutical Organic Chemistry-III	3	1	0	4
2	PC402	Medicinal Chemistry-I	3	1	0	4
3	PS403	Physical Pharmaceutics-II	3	1	0	4
4	PC404	Pharmacology-I	3	1	0	4
5	PC405	Pharmacognosy and Phytochemistry-I	3	1	0	4
6	PC406	Medicinal Chemistry-I Lab	0	0	4	2
7	PS407	Physical Pharmaceutics-II Lab	0	0	4	2
8	PC408	Pharmacology-I Lab	0	0	4	2
9	PC409	Pharmacognosy and Phytochemistry-I Lab	0	0	4	2
10	*MC400	Gender Sensitization Lab	1	0	0	0
		Total Credits	**16**	**05**	**16**	**28**

***MC-Satisfactory/Dissatisfactory**

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PS301: PHARMACEUTICAL ORGANIC CHEMISTRY –II

B. Pharm. II Year I Sem

L	T	P	C
3	1	0	4

Course Objectives: This subject deals with general methods of preparation and reactions of some organic compounds. Reactivity of organic compounds are also studied here. The syllabus emphasizes on mechanisms and orientation of reactions. Chemistry of fats and oils are also included in the syllabus.

Course Outcomes: Upon completion of the course the student shall be able to

- write the structure, name and the type of isomerism of the organic compound
- write the reaction, name the reaction and orientation of reactions
- account for reactivity/stability of compounds,
- prepare organic compounds

UNIT I **10 Hours**

Benzene and its derivatives

A. Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule

B. Reactions of benzene - nitration, sulphonation, halogenation-reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation.

C. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction

D. Structure and uses of DDT, Saccharin, BHC and Chloramine

UNIT-II **10 Hours**

Phenols* - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols

Aromatic Amines* - Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts

UNIT-III **10 Hours**

Fats and Oils

a. Fatty acids – reactions.
b. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.
c. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.

UNIT-IV **08 Hours**

Polynuclear hydrocarbons:

a. Synthesis, reactions

b. Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives

UNIT-V **07 Hours**

Cyclo alkanes*

Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only

Recommended Books (Latest Editions)

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

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PS302: PHYSICAL PHARMACEUTICS - I

B. Pharm. II Year I Sem

L	T	P	C
3	1	0	4

Course Objectives:

The course deals with the various physical, physicochemical properties and principle involved in dosage forms, formulations. Theory and practical components of the subject help the student to get a better insight in to various areas of formulation research and development and stability studies of pharmaceuticals.

Course Outcomes: Upon the completion of the course student shall be able to

- Understand various physicochemical properties of drug molecules in the designing the dosage form
- Know the principles of chemical kinetics & to use them in assigning expiry date for formulation
- Demonstrate use of physicochemical properties in evaluation of dosage forms.
- Appreciate physicochemical properties of drug molecules in formulation research and development

UNIT-I **10 Hours**

States of Matter and properties of matter: State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols–inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid-crystalline, amorphous & polymorphism.

Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications

UNIT-II **10 Hours**

Solubility of drugs: Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, Dissolution & drug release, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions, azeotropic mixtures, fractional distillation. Partially miscible liquids, Critical solution temperature(CST) and applications. Distribution law, its limitations and applications

UNIT-III **10 Hours**

Micromeretics: Particle size and distribution, average particle size, number and weight distribution, particle number, methods for determining particle size by (different methods), counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

UNIT-IV **08 Hours**

Complexation and protein binding: Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.

UNIT-V **07 Hours**

pH, buffers and Isotonic solutions: Sorensen's pH scale, pH determination lectrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions. Isotonicity, Colligative properties and determination of tonicity of a system.

Recommended Books: (Latest Editions)

1. Physical pharmacy by Alfred Martin
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea &Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical pharmaceutics by Ramasamy C and ManavalanR.
8. Laboratory manual of physical pharmaceutics, C.V.S. Subramanyam, J. Thimma settee

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BS303: PHARMACEUTICAL MICROBIOLOGY

B. Pharm. II Year I Sem

L	T	P	C
3	1	0	4

Course Objectives:

In the broadest sense, scope of microbiology is the study of all organisms that are invisible to the naked eye- that is the study of microorganisms.

Microorganisms are necessary for the production of bread, cheese, beer, antibiotics, vaccines, vitamins, enzymes etc.

Microbiology has an impact on medicine, agriculture, food science, ecology, genetics, biochemistry, immunology etc.

Course Outcomes: Upon completion of the subject student shall be able to;

- Understand methods of identification, cultivation and preservation of various microorganisms
- Importance of sterilization in microbiology. and pharmaceutical industry
- Learn sterility testing of pharmaceutical products.
- Microbiological standardization of Pharmaceuticals.
- Understand the cell culture technology and its applications in pharmaceutical industries.

UNIT-I **10 Hours**

Introduction, history of microbiology, its branches, scope and its importance. Introduction to Prokaryotes and Eukaryotes. Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count). Study of different types of phase constrast microscopy, dark field microscopy and electron microscopy.

UNIT-II **10 Hours**

Identification of bacteria using staining techniques (simple, Gram's &Acid fast staining) and biochemical tests (IMViC). Study of principle, procedure, merits, demerits and applications of Physical, chemical and mechanical method of sterilization. Evaluation of the efficiency of sterilization methods. Equipments employed in large scale sterilization. Sterility indicators.

UNIT-III **10 Hours**

Study of morphology, classification, reproduction/replication and cultivation of Fungi and Virus. Classification and mode of action of disinfectants. Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions. Evaluation of bactericidal & Bacteriostatic. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

UNIT-IV **08 Hours**

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification. Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic and testing of antimicrobial activity of a new substance. General aspects-environmental cleanliness.

UNIT-V **07 Hours**

Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage.

Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations. Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.

Recommended Books (Latest edition)

1. Rafi MD, Text book of biochemistry for undergraduates, 3rd edition, Universities press, 2017.
2. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
3. Prescott and Dunn, Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
4. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
5. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
6. Rose: Industrial Microbiology.
7. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
8. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
9. Peppler: Microbial Technology.
10. I.P., B.P., U.S.P.- latest editions.
11. Edward: Fundamentals of Microbiology.
12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company
14. Ananthanarayan and Paniker's textbook of Microbiology tenth edition

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PC304: PHARMACEUTICAL ENGINEERING

B. Pharm. II Year I Sem

L	T	P	C
3	1	0	4

Course Objectives:

This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.

Course Outcomes: Upon completion of the course student shall be able:

- To know various unit operations used in Pharmaceutical industries.
- To understand the material handling techniques.
- To perform various processes involved in pharmaceutical manufacturing process.
- To carry out various test to prevent environmental pollution.
- To appreciate and comprehend significance of plant lay out design for optimum use of resources.
- To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

UNIT-I **10 Hours**

Flow of fluids: Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.

Size Reduction: Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.

Size Separation: Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

Mixing: Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier,

UNIT-II **10 Hours**

Crystallization: Objectives, applications, & theory of crystallization. Solubility curves, principles, construction, working, uses, merits and demerits of Agitated batch crystallizer, Swenson Walker Crystallizer, Krystal crystallizer, Vacuum crystallizer. Caking of crystals, factors affecting caking & prevention of caking.

Evaporation: Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator.

Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers. List of equipment by name and their functions.

UNIT- III **10 Hours**

Drying: Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.

Distillation: Objectives, applications & types of distillation. principles, construction, working, uses, merits and demerits of (lab scale and industrial scale) Simple distillation, preparation of purified water and water for injection BP by distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

UNIT-IV **08 Hours**

Filtration: Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seitz filter. HEPA filters for controlled pollution.

Centrifugation: Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

UNIT- V **07 Hours**

Plant location, industrial hazards and plant safety: Plant Layout, utilities and services, Mechanical hazards, Chemical hazards, Fire hazards, explosive hazards and their safety.

Materials of pharmaceutical plant construction, Corrosion and its prevention: Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals.

Material handling systems: Objectives & applications of Material handling systems, different types of conveyors such as belt, screw and pneumatic conveyors.

Recommended Books: (Latest Editions)

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson-Latest edition.
3. Unit operation of chemical engineering – Mcabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
5. Remington practice of pharmacy- Martin, Latest edition.
6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.

7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.
8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

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PS305: PHARMACEUTICAL ORGANIC CHEMISTRY - II LAB

B. Pharm. II Year I Sem

L	T	P	C
0	0	4	2

I Experiments involving laboratory techniques
Recrystallization
Steam distillation

II Determination of following oil values (including standardization of reagents)
Acid value
Saponification value
Iodine value

III **Preparation of compounds**

- Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction.
- 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/ Acetanilide by halogenation (Bromination) reaction.
- 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction.
- Benzoic acid from Benzyl chloride by oxidation reaction.
- Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
- 1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions.
- Benzil from Benzoin by oxidation reaction.
- Dibenzal acetone from Benzaldehyde by Claison Schmidt reaction
- Cinnammic acid from Benzaldehyde by Perkin reaction
- *P*-Iodo benzoic acid from *P*-amino benzoic acid

Recommended Books (Latest Editions)

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

PS306: PHYSICAL PHARMACEUTICS – I LAB

B. Pharm. II Year I Sem

L	T	P	C
0	0	4	2

List of Experiments

1. Determination the solubility of drug at room temperature at different pH conditions
2. Determination of pKa value by Half Neutralization/ Henderson Hassel Balch equation
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl_4 and water
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of particle size, particle size distribution using sieving method
7. Determination of particle size, particle size distribution using Microscopic method
8. Determination of bulk density, true density and porosity
9. Determine the angle of repose and influence of lubricant on angle of repose
10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method
11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method

Recommended Books: (Latest Editions)

1. Physical pharmacy by Alfred Martin
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea &Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical pharmaceutics by Ramasamy C and ManavalanR.
8. Laboratory manual of physical pharmaceutics, C.V.S. Subramanyam, J. Thimma settee

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BS307: PHARMACEUTICAL MICROBIOLOGY LAB

B. Pharm. II Year I Sem

L	T	P	C
0	0	4	2

List of Experiments:

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test (IMViC reactions)
11. Revision Practical Class

Recommended Books (Latest edition)

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Peppler: Microbial Technology.
9. I.P., B.P., U.S.P.- latest editions.
10. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai
11. Edward: Fundamentals of Microbiology.
12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company

PC308: PHARMACEUTICAL ENGINEERING LAB

B. Pharm. II Year I Sem

L	T	P	C
0	0	4	2

List of Experiments:

1. Determination of radiation constant of brass, iron, unpainted and painted glass.
2. Steam distillation – To calculate the efficiency of steam distillation.
3. To determine the overall heat transfer coefficient by heat exchanger.
4. Construction of drying curves (for calcium carbonate and starch).
5. Determination of moisture content and loss on drying.
6. Determination of humidity of air – i) from wet and dry bulb temperatures –use of Dew point method.
7. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.
8. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.
9. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.
10. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.
11. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity
12. To study the effect of time on the Rate of Crystallization.
13. To calculate the uniformity Index for given sample by using Double Cone Blender.

Recommended Books (Latest edition)

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson- Latest edition.
3. Unit operation of chemical engineering – Mcabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
5. Remington practice of pharmacy- Martin, Latest edition.
6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.
8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

PS401: PHARMACEUTICAL ORGANIC CHEMISTRY – III

B. Pharm. II Year II Sem

L	T	P	C
3	1	0	4

Course Objectives: This subject imparts knowledge on stereo-chemical aspects of organic compounds and organic reactions, important named reactions, chemistry of important hetero cyclic compounds. It also emphasizes on medicinal and other uses of organic compounds.

Course Outcomes: At the end of the course, the student shall be able to

- understand the methods of preparation and properties of organic compounds
- explain the stereo chemical aspects of organic compounds and stereo chemical reactions
- know the medicinal uses and other applications of organic compounds

Note: To emphasize on definition, types, mechanisms, examples, uses/applications

UNIT-I **10 Hours**

Stereo isomerism

Optical isomerism – Optical activity, enantiomerism, diastereoisomerism, meso compounds Elements of symmetry, chiral and achiral molecules. DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers. Reactions of chiral molecules. Racemic modification and resolution of racemic mixture.

UNIT-II **10 Hours**

Geometrical isomerism

Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems). Methods of determination of configuration of geometrical isomers. Conformational isomerism in Ethane, n-Butane and Cyclohexane. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity.

UNIT-III **10 Hours**

Heterocyclic compounds:

Nomenclature and classification

Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene - Relative aromaticity, reactivity and Basicity of pyrrole

UNIT-IV **8 Hours**

Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrazole, Imidazole, Oxazole and Thiazole.

Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives

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UNIT-V **07 Hours**

Reactions of synthetic importance

Metal hydride reduction ($NaBH_4$ and $LiAlH_4$), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation

Recommended Books (Latest Editions)

1. Organic chemistry by I.L. Finar, Volume-I & II.
2. A text book of organic chemistry – Arun Bahl, B.S. Bahl.
3. Heterocyclic Chemistry by Raj K. Bansal
4. Organic Chemistry by Morrison and Boyd
5. Heterocyclic Chemistry by T.L. Gilchrist

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PC402: MEDICINAL CHEMISTRY – I

B. Pharm. II Year II Sem

L	T	P	C
3	1	0	4

Course Objectives: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Course Outcomes: Upon completion of the course the student shall be able to

- understand the chemistry of drugs with respect to their pharmacological activity
- understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
- know the Structural Activity Relationship (SAR) of different class of drugs
- write the chemical synthesis of some drugs

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

UNIT- I **10 Hours**

Introduction to Medicinal Chemistry

History and development of medicinal chemistry. Physicochemical properties in relation to biological action. Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.

Drug metabolism

Drug metabolism principles- Phase I and Phase II. Factors affecting drug metabolism including stereo chemical aspects.

UNIT- II **10 Hours**

Drugs acting on Autonomic Nervous System

Adrenergic Neurotransmitters: Biosynthesis and catabolism of catecholamine. Adrenergic receptors (Alpha & Beta) and their distribution.

Sympathomimetic agents: SAR of Sympathomimetic agents

Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.

Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.

Agents with mixed mechanism: Ephedrine, Metaraminol.

Adrenergic Antagonists:

Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.

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Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.

UNIT-III **10 Hours**

Cholinergic neurotransmitters: Biosynthesis and catabolism of acetylcholine.
Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.

Parasympathomimetic agents: SAR of Parasympathomimetic agents

Direct acting agents: Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine.

Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophate iodide, Parathione, Malathion.

Cholinesterase reactivator: Pralidoxime chloride.

Cholinergic Blocking agents: SAR of cholinolytic agents

Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*.

Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride.

UNIT- IV **08 Hours**

Drugs acting on Central Nervous System

A. Sedatives and Hypnotics:

Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem

Barbiturtes: SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital, Amobarbital, Butabarbital, Pentobarbital, Secobarbital

Miscelleneous:

Amides & imides: Glutethmide.
Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol.
Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

B. Antipsychotics

Phenothiazeines:SAR of Phenothiazeines Promazine hydrochloride, Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride.

Ring Analogues of Phenothiazeines: Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.

Fluro buterophenones: Haloperidol, Droperidol, Risperidone.

Beta amino ketones: Molindone hydrochloride.

Benzamides: Sulpieride.

C. Anticonvulsants: SAR of Anticonvulsants**,** mechanism of anticonvulsant action

Barbiturates: Phenobarbitone, Methabarbital.

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Hydantoins: Phenytoin, Mephenytoin, Ethotoin
Oxazolidine diones: Trimethadione, Paramethadione
Succinimides: Phensuximide, Methsuximide, Ethosuximide
Urea and monoacylureas: Phenacemide, Carbamazepine
Benzodiazepines: Clonazepam
Miscellaneous: Primidone, Valproic acid , Gabapentin, Felbamate

UNIT – V **07 Hours**

Drugs acting on Central Nervous System

General anesthetics:

Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

Ultra short acting barbitutrates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium.

Dissociative anesthetics: Ketamine hydrochloride.*

Narcotic and non-narcotic analgesics

Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.

Narcotic antagonists: Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride.

Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

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PS403: PHYSICAL PHARMACEUTICS - II

B. Pharm. II Year II Sem

L	T	P	C
3	1	0	4

Course Objectives: The course deals with the various physical, physicochemical properties and principle involved in dosage forms, formulations. Theory and practical components of the subject help the student to get a better insight in to various areas of formulation research and development and stability studies of pharmaceuticals.

Course Outcomes: Upon the completion of the course student shall be able to

- Understand various physicochemical properties of drug molecules in the designing the dosage form
- Know the principles of chemical kinetics & to use them in assigning expiry date for Formulation
- Demonstrate use of physicochemical properties in evaluation of dosage forms.
- Appreciate physicochemical properties of drug molecules in formulation research and Development

UNIT-I **10 Hours**

Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention

UNIT-II **10 Hours**

Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatants, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers

Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus

UNIT-III **10 Hours**

Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Physical stability of emulsions, preservation of emulsions, rheological properties of emulsions, phase equilibria and emulsion formulation.

UNIT-IV **08 Hours**

Surface and interfacial phenomenon: Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.

UNIT-V **07 Hours**

Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization& protective action.

Recommended Books: (Latest Editions)

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

PC404: PHARMACOLOGY - I

B. Pharm. II Year II Sem

L	T	P	C
3	1	0	4

Course Objectives: The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics. The subject covers the information about the drugs like, mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.

Course Outcomes: Upon completion of this course the student should be able to

- Understand the pharmacological actions of different categories of drugs
- Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.
- Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
- Observe the effect of drugs on animals by simulated experiments
- Appreciate correlation of pharmacology with other bio medical sciences

UNIT-I **08 hours**

1. General Pharmacology

a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists(competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.

b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination

UNIT-II **10 Hours**

General Pharmacology

Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.

a. Adverse drug reactions.
b. Drug interactions (pharmacokinetic and pharmacodynamic)
c. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

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UNIT-III **10 Hours**

2. Pharmacology of peripheral nervous system

a. Organization and function of ANS.

b.Neurohumoral transmission,co-transmission and classification of neurotransmitters.

c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics.

d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).

e. Local anesthetic agents.

f. Drugs used in myasthenia gravis and glaucoma

UNIT-IV **10 Hours**

3. Pharmacology of central nervous system

a. Neurohumoral transmission in the C.N.S.special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.
b. General anesthetics and pre-anesthetics**.**
c. Sedatives, hypnotics and centrally acting muscle relaxants.
d. Anti-epileptics
e. Alcohols and disulfiram

UNIT-V **7 Hours**

Pharmacology of central nervous system 07 Hours

a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.
b. Drugs used in Parkinsons disease and Alzheimer's disease.
c. CNS stimulants and nootropics.
d. Opioid analgesics and antagonists
e. Drug addiction, drug abuse, tolerance and dependence.

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert,
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan,

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PC405: PHARMACOGNOSY AND PHYTOCHEMISTRY - I

B. Pharm. II Year II Sem

L	T	P	C
3	1	0	4

Course Objective: The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.

Course Outcomes: Upon completion of the course, the student shall be able

- to know the techniques in the cultivation and production of crude drugs
- to know the crude drugs, their uses and chemical nature
- know the evaluation techniques for the herbal drugs
- to carry out the microscopic and morphological evaluation of crude drugs

UNIT-I **10 Hours**

Introduction to Pharmacognosy: Definition, history, scope and development of Pharmacognosy

(a) Sources of Drugs – Plants, Animals, Marine & Tissue culture

(b) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

Classification of drugs: Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

Quality control of Drugs of Natural Origin: Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.

Quantitative microscopy of crude drugs including lycopodium spore method, leafconstants, camera lucida and diagrams of microscopic objects to scale with camera lucida.

UNIT-II **10 Hours**

Cultivation, Collection, Processing and storage of drugs of natural origin:

Cultivation and Collection of drugs of natural origin. Factors influencing cultivation of medicinal plants. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants.

UNIT-III **7 Hours**

Plant tissue culture: Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy. Edible vaccines

UNIT IV **10 Hours**

Pharmacognosy in various systems of medicine:

Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda,

Unani, Siddha, Homeopathy and Chinese systems of medicine.

Introduction to secondary metabolites:
Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins

UNIT V **08 Hours**

Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs

Plant Products: Fibers - Cotton, Jute, Hemp
Hallucinogens, Teratogens, Natural allergens

Primary metabolites:
General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites: **Carbohydrates:** Acacia, Agar, Tragacanth, Honey

Proteins and Enzymes: Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).

Lipids (Waxes, fats, fixed oils) : Castor oil,
Chaulmoogra oil, Wool Fat, Bees Wax **Marine Drugs:**
Novel medicinal agents from marine sources

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
6. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
9. Anatomy of Crude Drugs by M.A. Iyengar

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PC406: MEDICINAL CHEMISTRY – I LAB

B. Pharm. II Year II Sem

L	T	P	C
0	0	4	2

List of Experiments:

I Preparation of drugs/ intermediates

1. 1,3-pyrazole
2. 1,3-oxazole
3. Benzimidazole
4. Benztriazole
5. 2,3- diphenyl quinoxaline
6. Benzocaine
7. Phenytoin
8. Phenothiazine
9. Barbiturate

II Assay of drugs

1. Chlorpromazine
2. Phenobarbitone
3. Atropine
4. Ibuprofen
5. Aspirin
6. Furosemide

III Determination of Partition coefficient for any two drugs

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. rganic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I. Vogel

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PS407: PHYSICAL PHARMACEUTICS – II LAB

B. Pharm. II Year II Sem

L	T	P	C
0	0	4	2

List of Experiments:

1. Determination of surface tension of given liquids by drop count and drop weight method
2. Determination of HLB number of a surfactant by saponification method
3. Determination of Freundlich and Langmuir constants using activated char coal
4. Determination of critical micellar concentration of surfactants
5. Determination of viscosity of liquid using Ostwald's viscometer
6. Determination sedimentation volume with effect of different suspending agent
7. Determination sedimentation volume with effect of different concentration of single suspending agent
8. Determination of viscosity of semisolid by using Brookfield viscometer
9. Determination of reaction rate constant first order.
10. Determination of reaction rate constant second order
11. Accelerated stability studies

Recommended Books: (Latest Editions)

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

PC408: PHARMACOLOGY – I LAB

B. Pharm. II Year II Sem

L	T	P	C
0	0	4	2

List of Experiments:

1. Introduction to experimental pharmacology.
2. Commonly used instruments in experimental pharmacology.
3. Study of common laboratory animals.
4. Maintenance of laboratory animals as per CPCSEA guidelines.
5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6. Study of different routes of drugs administration in mice/rats.
7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.
8. Effect of drugs on ciliary motility of frog oesophagus
9. Effect of drugs on rabbit eye.
10. Effects of skeletal muscle relaxants using rota-rod apparatus.
11. Effect of drugs on locomotor activity using actophotometer.
12. Anticonvulsant effect of drugs by MES and PTZ method.
13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14. Study of anxiolytic activity of drugs using rats/mice.
15. Study of local anesthetics by different methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert.
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan,

PC409: PHARMACOGNOSY AND PHYTOCHEMISTRY – I LAB

B. Pharm. II Year II Sem

L	T	P	C
0	0	4	2

List of Experiments:

1. Analysis of crude drugs by chemical tests: **(**i)Tragaccanth (ii) Acacia (iii)Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil
2. Determination of stomatal number and index
3. Determination of vein islet number, vein islet termination and paliside ratio.
4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer
5. Determination of Fiber length and width
6. Determination of number of starch grains by Lycopodium spore method
7. Determination of Ash value
8. Determination of Extractive values of crude drugs
9. Determination of moisture content of crude drugs
10. Determination of swelling index and foaming

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
6. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
9. Anatomy of Crude Drugs by M.A. Iyengar

MC400: GENDER SENSITIZATION LAB

B. Pharm. II Year II Sem

L	T	P	C
1	0	0	0

Course Objectives:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Course Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT-I

UNDERSTANDING GENDER

Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)

Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)

Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT-II

GENDER AND BIOLOGY

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)

Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)

Two or Many? Struggles with Discrimination.

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UNIT-III

GENDER AND LABOUR

Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3)

"My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT-IV

ISSUES OF VIOLENCE

Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu"*.

Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)

Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT-V

GENDER: CO - EXISTENCE

Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

TEXTBOOK

All the five Units in the Textbook**, *"Towards a World of Equals: A Bilingual Textbook on Gender"*** written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by **Telugu Akademi, Hyderabad**,Telangana State in the year **2015**.

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering/pharmacy departments.

REFERENCE BOOKS:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. *"I Fought For My Life…and Won."*Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. PHARMACY III YEAR COURSE STRUCTURE AND SYLLABUS

Effective from Academic Year 2017-18 Admitted Batch

III Year I Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	PS501	Medicinal Chemistry II	3	1	0	4
2	PS502	Industrial Pharmacy - I	3	1	0	4
3	PS503	Pharmacology II	3	1	0	4
4	PS504	Pharmacognosy and Phytochemistry - II	3	1	0	4
5	 PS505 PS506 PS507 PS508	**Open Elective - I** I. Generic Product Development II. Green Chemistry III. Cell and Molecular Biology IV. Cosmetic science	3	1	0	4
6	PS509	Industrial Pharmacy lab	0	0	4	2
7	PS510	Pharmacology - II lab	0	0	4	2
8	PS511	Pharmacognosy and Phytochemistry - II lab	0	0	4	2
9	*MC500	Environmental sciences	1	0	0	0
		Total	**16**	**05**	**12**	**26**

III Year II Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	PS601	Medicinal Chemistry - III	3	1	0	4
2	PS602	Pharmacology - III	3	1	0	4
3	PS603	Herbal Drug Technology	3	1	0	4
4	PS604	Biopharmaceutics and Pharmacokinetics	3	1	0	4
5	 PS605 PS606 PS607 PS608	**Open Elective - II** I. Pharmaceutical Quality Assurance II. Pharmaceutical Biotechnology III. Bioinformatics IV. Screening Methods in Pharmacology	3	1	0	4
6	PS609	Medicinal chemistry - III lab	0	0	4	2
7	PS610	Pharmacology - III lab	0	0	4	2
8	PS611	Herbal Drug Technology lab	0	0	4	2
9	*MC600	Human Values and Professional Ethics	1	0	0	0
		Total	**16**	**05**	**12**	**26**

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PS501: MEDICINAL CHEMISTRY – II

B.Pharm. III Year I Sem. **L T/P/ C**
3 1/0/ 4

Course Objective: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties, absorbtion, distribution and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Course Outcomes: Upon completion of the course the student shall be able to

1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. Know the Structural Activity Relationship of different class of drugs
4. Study the chemical synthesis of selected drugs

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

UNIT- I **10 Hours**

Antihistaminic agents: Histamine, receptors and their distribution in the humanbody

H_1–antagonists: Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines succinate, Clemastine fumarate, Diphenylphyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium

H_2-antagonists: Cimetidine*, Famotidine, Ranitidin.

Gastric Proton pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole

Anti-neoplastic agents:

Alkylating agents: Meclorethamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa

Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine

Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin

Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate

Miscellaneous: Cisplatin, Mitotane.

UNIT – II **10 Hours**

Anti-anginal:

Vasodilators: Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole.

Calcium channel blockers: Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine.

Diuretics:

Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide.

Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide,

Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid.

Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride.

Osmotic Diuretics: Mannitol

Anti-hypertensive Agents: Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril

hydrochloride, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.

UNIT - III **10 Hours**

Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol.

Anti-hyperlipidemic agents: Clofibrate, Lovastatin, Cholesteramine and Cholestipol

Coagulant & Anticoagulants: Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel

Drugs used in Congestive Heart Failure: Digoxin, Digitoxin, Nesiritide Bosentan, Tezosentan.

UNIT - IV **08 Hours**

Drugs acting on Endocrine system

Nomenclature, Stereochemistry and metabolism of steroids

Sex hormones: Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol.

Drugs for erectile dysfunction: Sildenafil, Tadalafil.

Oral contraceptives: Mifepristone, Norgestril, Levonorgestrol

Corticosteroids: Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone

Thyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.

UNIT – V **07 Hours**

Antidiabetic agents:

Insulin and its preparations

Sulfonyl ureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride.

Biguanides: Metformin.

Thiazolidinediones: Pioglitazone, Rosiglitazone.

Meglitinides: Repaglinide, Nateglinide.

Glucosidase inhibitors: Acarbose, Voglibose.

Local Anesthetics: SAR of Local anesthetics

Benzoic Acid derivatives; Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine.

Amino Benzoic acid derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate.

Lidocaine/Anilide derivatives: Lignocaine, Mepivacaine, Prilocaine, Etidocaine.

Miscellaneous: Phenacaine, Diperodon, Dibucaine.*

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1to 5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

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PS502: INDUSTRIAL PHARMACY - I

B.Pharm. III Year I Sem. **L T/P/ C**
3 1/0/ 4

Course Objective: Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.

Course Outcomes: Upon completion of the course the student shall be able to

- Know the various pharmaceutical dosage forms and their manufacturing techniques.
- Know various considerations in development of pharmaceutical dosage forms
- Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

UNIT - I **07 Hours**

Preformulation Studies: Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances.

a. Physical properties: Physical form (Crystalline and amorphous forms: Concepts of polymorphism and its significance in industrial setup), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient).

b. Chemical Properties: Hydrolysis, oxidation, reduction, racemisation, polymerization BCS classification of drugs

Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

UNIT - II **10 Hours**

Tablets:

a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling.
b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating.
c. Quality control tests: In process and finished product tests

Liquid orals: Formulation and manufacturing consideration of solutions, suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia

UNIT – III **08 Hours**

Capsules:

a. **Hard gelatin capsules:** Introduction, Extraction of gelatin and production of hard gelatin capsule shells. size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules. In process and final product quality control tests for capsules.
b. **Soft gelatin capsules:** Nature of shell and capsule content, size of capsules,importance of base adsorption and minimum/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules

Pellets: Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets, Fluidised bed coater(FBC).

UNIT - IV **10 Hours**

Parenteral Products:

a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity
b. Production procedure, production facilities and controls.

c. Formulation of injections, sterile powders, emulsions, suspensions, large volume parenterals and lyophilized products, Sterilization.
d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests.

Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations

UNIT – V **10 Hours**

Cosmetics: Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.

Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.

Packaging Materials Science: Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.

TEXT BOOKS: (Latest Editions)

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H. A. Liberman, Leon Lachman & J. B. Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E. Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C. Ansel, Lea & Febiger, Philadelphia, 5th edition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.
10. Pharmaceutical Technology 1 &11 BY Gaurav Agarwal CBS Publishers
11. Pharmaceutics Basic principles and Formulations by D.K. Tripati Pharma med press

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PS503: PHARMACOLOGY - II

B.Pharm. III Year I Sem. **L T/P/ C**
3 1/0/ 4

Course Objective: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body and in addition, emphasis on the basic concepts of bioassay.

Course Outcomes: Upon completion of this course the student should be able to

- Understand the mechanism of drug action and its relevance in the treatment of different diseases
- Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
- Demonstrate the various receptor actions using isolated tissue preparation
- Appreciate correlation of pharmacology with related medical sciences

UNIT - I **10 hours**

Pharmacology of drugs acting on cardio vascular system

a. Introduction to hemodynamic and electrophysiology of heart.
b. Drugs used in congestive heart failure
c. Anti-hypertensive drugs.
d. Anti-anginal drugs.
e. Anti-arrhythmic drugs.
f. Anti-hyperlipidemic drugs.

UNIT – II **10 hours**

1. **Pharmacology of drugs acting on cardio vascular system**
   a. Drug used in the therapy of shock.
   b. Hematinics, coagulants and anticoagulants.
   c. Fibrinolytics and anti-platelet drugs
   d. Plasma volume expanders
2. **Pharmacology of drugs acting on urinary system**
   a. Diuretics
   b. Anti-diuretics.

UNIT - III **10 hours**

Autocoids and related drugs

a. Introduction to autacoids and classification
b. Histamine, 5-HT and their antagonists.
c. Prostaglandins, Thromboxanes and Leukotrienes.
d. Angiotensin, Bradykinin and Substance P.
e. Non-steroidal anti-inflammatory agents
f. Anti-gout drugs
g. Antirheumatic drugs

UNIT - IV **08 hours**

Pharmacology of drugs acting on endocrine system

a. Basic concepts in endocrine pharmacology.

b. Anterior Pituitary hormones- analogues and their inhibitors.
c. Thyroid hormones- analogues and their inhibitors.
d. Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D.
e. Insulin, Oral Hypoglycemic agents and glucagon.
f. ACTH and corticosteroids.

UNIT - V **07 hours**

1. **Pharmacology of drugs acting on endocrine system**
   a. Androgens and Anabolic steroids.
   b. Estrogens, progesterone and oral contraceptives.
   c. Drugs acting on the uterus.
2. **Bioassay**
   a. Principles and applications of bioassay.
   b. Types of bioassay
   c. Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine

TEXT BOOKS (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology,
2. Churchil Livingstone Elsevier
3. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.
4. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
5. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins.
6. Mycek M. J, Gelnet S. B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology.
7. K. D. Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
8. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
9. Modern Pharmacology with clinical Applications, by Charles R. Craig& Robert.
10. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
11. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.

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PS504: PHARMACOGNOSY AND PHYTOCHEMISTRY - II

B.Pharm. III Year I Sem. **L T/P/ C**
3 1/0/ 4

Course Objective: The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially. Also this subject involves the study of producing the plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine

Course Outcomes: Upon completion of the course, the student shall be able

- To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
- To understand the preparation and development of herbal formulation.
- To understand the herbal drug interactions
- To carryout isolation and identification of phytoconstituents

UNIT - I **7 Hours**

Metabolic pathways in higher plants and their determination

- Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway.
- Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.

UNIT - II **10 Hours**

General introduction, composition, chemistry & chemical classes, general methods of extraction & analysis, biosources, therapeutic uses and commercial applications of following secondary metabolites.
Alkaloids: Vinca, Rauwolfia, Belladonna, Opium,
Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta
Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis
Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander,

UNIT - III **10 Hours**

Tannins: Catechu, Pterocarpus
Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony
Glycosides: Senna, Aloes, Bitter Almond
Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, taxus, carotenoids

UNIT - IV **10 Hours**

Isolation, Identification and analysis of phytoconstituents

a. Terpenoids: Menthol, Citral and Artemisin
b. Glycosides: Glycyrhetinic acid and Rutin
c. Alkaloids: atropine, Quinine, Reserpine and Caffeine
d. Resins: Podophyllotoxin and Curcumin

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UNIT - V 8 Hours

Industrial production, estimation and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine. Modern methods of extraction.

TEXT BOOKS: (Latest Editions)

1. W. C. Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.

2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
4. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
5. Essentials of Pharmacognosy, Dr. SH. Ansari, IInd edition, Birla publications, New Delhi, 2007
6. Herbal Cosmetics by H. Pande, Asia Pacific Business press, Inc, New Delhi.
7. A. N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
10. The formulation and preparation of cosmetic, fragrances and flavours.
11. Remington's Pharmaceutical sciences.
12. Text Boo of Biotechnology by Vyas and Dixit.
13. Text Book of Biotechnology by R. C. Dubey.

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PS505: GENERIC PRODUCT DEVELOPMENT
(Open Elective - I)

B.Pharm. III Year I Sem. **L T/P/ C**
3 1/0/ 4

Course Objectives: To learn the generic drug product development process, dosage form design and development, analytical method development and dossier approval process.

Course Outcome: The knowledge of the students is enhanced with the clear information about the generic product development.

UNIT - I

a. Concept of generic drug product development, Hatch-Waxman act and its amendments.
b. History of generic product development in US

UNIT - II

Design of dosage form to meet equivalence to reference listed drug, product development steps, formula optimization, process optimization and packaging selection.

UNIT - III

Analytical method development for verification and validation for active ingredient, in-process samples and finished dosage forms.

UNIT - IV

a. Stability studies on active ingredient and finished dosage forms, accelerated stability studies, stability studies at different conditions, determination or expiration date.
b. Scale up studies to optimize manufacturing process and execution of exhibit batches.

UNIT - V

a. Bioequivalence studies, various designs of bioequivalence studies, bioequivalence criteria and in-vitro tests to ensure bioequivalence of test product.
b. Introduction to electronic Common Technical Document (eCTD), various modules and the important information in each module.
c. Drug product approval process in India and US.

REFERENCE BOOKS

1. Generic Drug product Development: Solid oral dosage forms-Leon Shargel.
2. ICH guidelines.

PS506: GREEN CHEMISTRY
(Open Elective - I)

B.Pharm. III Year I Sem. **L T/P/ C**
3 1/0/ 4

Course Objectives: To familiarize students about environment benign chemical synthesis. To make students familiarize with principles and importance of various green chemical synthesis. To provide adequate knowledge regarding green reactions, green solvents and other alternative green approaches. To impart adequate information regarding environment pollution, contributing factors and the concerns.

Course Outcomes: Upon completion of this course, the students should be able to: Explain the environment pollution factors. Understand the different greener approaches along with their principles.

UNIT - I
Introduction to green chemistry
Inception of green chemistry: history and development.
Principles of green chemistry: description with examples.
Synthetic approaches of green chemistry: in water, solvent less, microwave, ultrasonic, catalytic and synthesis.

UNIT - II
In water and solvent less organic reactions
In water reactions: principle and process involved in the Michael reaction and Wartz synthesis
Solvent less organic synthesis:
Alternative solvents used in green chemistry strategies

UNIT - III
Microwave and ultrasonic mediated reactions
Microwave reactions: principles and process involved in the Fries rearrangement, Diels Alder reaction and Metal halide reduction
Ultrasonic reaction: principle and process involved in the Strecker and Reformatsky reactions

UNIT - IV
Catalytic and solid supported reactions
Catalytic reactions: principle and process involved in the reactions catalyzed by metal catalysts, ionic liquids (Knovenegel ondensatin) and bio catalysts (Villeger reaction)
Solid supported reactions: principles and process
Alternative reagents used in green chemistry strategies.

UNIT - V
Greener synthesis of pharmaceuticals: Principle and procedure of the following synthesis
Nicotinic acid, Ibuprofen, paracetamol, Aspirin
Future trends in Green chemistry

REFERENCE BOOKS

1. Paul T Anastas, John Charles Warmer. Green chemistry: theory and practice. Oxford university Press, 1988
2. Alluwalia V.K,Green chemistry : environmentally benign reactions. 2nd edn,Ane Books Pvt Ltd, New Delhi, 2012
3. Alluwalia V.K, M. Kidwai, New trends in green chemistry. 2nd edn, Anamaya Publishers, New delhi, 2004.

PS507: CELL AND MOLECULAR BIOLOGY
(Open Elective - I)

B.Pharm. III Year I Sem. **L T/P/ C**
3 1/0/ 4

Course Objectives: Cell biology is a branch of biology that studies cells – their physiological properties, their structure, the organelles they contain, interactions with their environment, their life cycle, division, death and cell function.
This is done both on a microscopic and molecular level.
Cell biology research encompasses both the great diversity of single-celled organisms like bacteria and protozoa, as well as the many specialized cells in multi-cellular organisms such as humans, plants, and sponges.

Course Outcomes: Upon completion of the subject student shall be able to:

- Summarize cell and molecular biology history.
- Summarize cellular functioning and composition.
- Describe the chemical foundations of cell biology.
- Summarize the DNA properties of cell biology.
- Describe protein structure and function.
- Describe cellular membrane structure and function.
- Describe basic molecular genetic mechanisms.
- Summarize the Cell Cycle

UNIT – I **10 Hours**

a. Cell and Molecular Biology: Definitions theory and basics and Applications.
b. Cell and Molecular Biology: History and Summation.
c. Theory of the Cell? Properties of cells and cell membrane.
d. Prokaryotic versus Eukaryotic
e. Cellular Reproduction
f. Chemical Foundations – an Introduction and Reactions (Types)

UNIT – II **10 Hours**

a. DNA and the Flow of Molecular Structure
b. DNA Functioning
c. DNA and RNA
d. Types of RNA
e. Transcription and Translation

UNIT – III **10 Hours**

a. Proteins: Defined **and** Amino Acids
b. Protein Structure
c. Regularities in Protein Pathways
d. Cellular Processes
e. Positive Control and significance of Protein Synthesis

UNIT – IV **08 Hours**

a. Science of Genetics
b. Transgenics and Genomic Analysis
c. Cell Cycle analysis
d. Mitosis and Meiosis
e. Cellular Activities and Checkpoints

UNIT – V **07 Hours**

a. Cell Signals: Introduction
b. Receptors for Cell Signals
c. Signaling Pathways: Overview
d. Misregulation of Signaling Pathways
e. Protein-Kinases: Functioning

Recommended Books (latest edition):

1. Ananthanarayana and Panikers, Text book of microbiology, 10th edition by universities press.
2. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
3. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
4. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
5. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
6. Rose: Industrial Microbiology.
7. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
8. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
9. Peppler: Microbial Technology.
10. Edward: Fundamentals of Microbiology.
11. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
12. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company
13. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of Recombinant DNA: ASM Press Washington D.C.
14. RA Goldshy et. al., Kuby Immunology.

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PS508: COSMETIC SCIENCE
(Open Elective - I)

B.Pharm. III Year I Sem. **L T/P/ C**
3 1/0/ 4

Course Objective: This subject deals with cosmetic products, cosmetic excipients, skin care products and their methods of preparation and evaluations.

Course Outcomes:

- Upon completion of the course the student shall be able to know the regulations pertaining to cosmetics and cosmetic excipients.
- They will be knowing the preparations of various skin care products like creams, anti-perspirants, deodorants, hair care products etc.
- They also know about the role of herbs in sunscreens.

UNIT – I **10 Hours**

Classification of cosmetic and cosmeceutical products

Cosmetic excipients: Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application **Skin:** Basic structure and function of skin.

Hair: Basic structure of hair. Hair growth cycle.

Oral Cavity: Common problem associated with teeth and gums**.**

UNIT – II 1**0 Hours**

Principles of formulation and building blocks of skin care products:

Face wash,

Moisturizing cream, Cold Cream, Vanishing cream their relative skin sensory, advantages and disadvantages. Application of these products in formulation of cosmecuticals.

Principles of formulation and building blocks of Hair care products:

Conditioning shampoo, Hair conditioners, antidandruff shampoo.

Hair oils.

Chemistry and formulation of Para-phylene diamine based hair dye. Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.

UNIT – III **10 Hours**

Sun protection, Classification of Sunscreens and SPF.

Role of herbs in cosmetics:

Skin Care: Aloe and turmeric

Hair care: Henna and amla.

Oral care: Neem and clove

Analytical cosmetics: BIS specification and analytical methods for shampoo, skin-cream and toothpaste**.**

UNIT – IV **08 Hours**

Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs.

Principles of Cosmetic Evaluation: Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties Soaps, and syndet bars. Evolution and skin benefits.

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UNIT – V **07 Hours**

Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis.

Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor.

Antiperspirants and Deodorants- Actives and mechanism of action

REFERENCE BOOKS:

1. Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
2. Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.
3. Textbook of Cosmetics by Rajesh Kumar Nema, Kmal singh Rathore and BK Dubey
4. Textbook of Cosmetics by M. Vimaladevi

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PS509: INDUSTRIAL PHARMACY LAB

B.Pharm. III Year I Sem. **L T/P/ C**
0 0/4/ 2

List of Experiments:

1. Preformulation study for prepared granules
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets
5. Preparation and evaluation of Tetracycline capsules
6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Preparation of Paracetamol Syrup
9. Preparation of Eye drops
10. Preparation of Pellets by extrusion spheronization technique
11. Preparation of Creams (cold / vanishing cream)
12. Evaluation of Glass containers (As per IP)

Recommended Books: (Latest Editions)

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman & J. B. Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M. E. Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C. Ansel, Lea & Febiger, Philadelphia, 5th edition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

PS510: PHARMACOLOGY - II LAB

B.Pharm. III Year I Sem. **L T/P/ C**
0 0/4/ 2

List of Experiments:

1. Introduction to *in-vitro* pharmacology and physiological salt solutions.
2. Effect of drugs on isolated frog heart.
3. Effect of drugs on blood pressure and heart rate of dog.
4. Study of diuretic activity of drugs using rats/mice.
5. DRC of acetylcholine using frog rectus abdominis muscle.
6. Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.
7. Bioassay of histamine using guinea pig ileum by matching method.
8. Bioassay of oxytocin using rat uterine horn by interpolation method.
9. Bioassay of serotonin using rat fundus strip by three point bioassay.
10. Bioassay of acetylcholine using rat ileum/colon by four point bioassay.
11. Determination of PA_2 value of prazosin using rat anococcygeus muscle (by Schilds plot method).
12. Determination of PD_2 value using guinea pig ileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity of drug using central and peripheral methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology,
2. Churchil Livingstone Elsevier
3. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.
4. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
5. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins.
6. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology.
7. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
8. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
9. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert.
10. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
11. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.

PS511: PHARMACOGNOSY AND PHYTOCHEMISTRY II LAB

B.Pharm. III Year I Sem. **L T/P/ C**
0 0/4/ 2

List of Experiments:

(1) Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander
(2) Exercise involving isolation & detection of active principles
   a. Caffeine - from tea dust.
   b. Diosgenin from Dioscorea
   c. Atropine from Belladonna
   d. Sennosides from Senna
(3) Separation of sugars by Paper chromatography
(4) TLC of herbal extract
(5) Distillation of volatile oils and detection of phytoconstitutents by TLC
(6) Analysis of crude drugs by chemical tests: (i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh

Recommended Books: (Latest Editions)

1. W. C. Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
3. Text book of Pharmacognosy by C. K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
4. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
5. Essentials of Pharmacognosy, Dr. SH. Ansari, IInd edition, Birla publications, New Delhi, 2007
6. Herbal Cosmetics by H. Pande, Asia Pacific Business press, Inc, New Delhi.
7. A. N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
10. The formulation and preparation of cosmetic, fragrances and flavours.
11. Remington's Pharmaceutical sciences.
12. Text Book of Biotechnology by Vyas and Dixit.
13. Text Book of Biotechnology by R.C. Dubey.

***MC500: ENVIRONMENTAL SCIENCES**

B.Pharm. III Year I Sem. **L T/P/ C**
1 0/0/ 0

Course Objectives: Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.

Course Outcomes: Upon completion of the course the student shall be able to**:**

- Create the awareness about environmental problems among learners.
- Impart basic knowledge about the environment and its allied problems.
- Develop an attitude of concern for the environment.
- Motivate learner to participate in environment protection and environment improvement.
- Acquire skills to help the concerned individuals in identifying and solving environmental problems.
- Strive to attain harmony with Nature.

UNIT – I
The Multidisciplinary nature of environmental studies
Natural Resources
Renewable and non-renewable resources:
Natural resources and associated problems

a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.

UNIT – II
Ecosystems
Concept of an ecosystem.
Structure and function of an ecosystem.
Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT – III
Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

Unit – IV
Environmental Pollution: Air pollution; Water pollution; Soil pollution, Noise Pollution

UNIT -- V
Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act.
Towards Sustainable Future: Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

Recommended Books (Latest edition):

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India,
4. Text book of environmental science and technology, Dr. M. Anji Reddy.
5. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
6. Clark R.S., Marine Pollution, Clanderson Press Oxford
7. Cunningham, W.P. Cooper, T. H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
8. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
9. Down of Earth, Centre for Science and Environment

PS601: MEDICINAL CHEMISTRY – III

B.Pharm. III Year II Sem. **L T/P/ C**
3 1/0/ 4

Course Objectives: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasis on modern techniques of rational drug design like quantitative structure activity relationship (QSAR), Prodrug concept, combinatorial chemistry and Computer aided drug design (CADD). The subject also emphasizes on the chemistry, mechanism of action, metabolism, adverse effects, Structure Activity Relationships (SAR), therapeutic uses and synthesis of important drugs.

Course Outcomes: Upon completion of the course student shall be able to

- Understand the importance of drug design and different techniques of drug design.
- Understand the chemistry of drugs with respect to their biological activity.
- Know the metabolism, adverse effects and therapeutic value of drugs.
- Know the importance of SAR of drugs.

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted by (*)

UNIT – I **10 Hours**

Antibiotics:

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

Beta-Lactam antibiotics: Penicillin, Cephalosporins, Beta-Lactamase inhibitors, Monobactams

Aminoglycosides: Streptomycin, Neomycin, Kanamycin

Tetracyclines: Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline

UNIT – II **10 Hours**

Antibiotics:

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation, classification and important products of the following classes.

Macrolide: Erythromycin Clarithromycin, Azithromycin.

Miscellaneous: Chloramphenicol*, Clindamycin.

Prodrugs: Basic concepts and application of prodrugs design.

Antimalarials: Etiology of malaria.

Quinolines: SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine.

Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil.

Miscellaneous: Pyrimethamine, Artesunete, Artemether, Atovoquone.

UNIT – III **10 Hours**

Anti-tubercular Agents

Synthetic anti tubercular agents: Isoniazid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.*

Anti-tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine Streptomycine, Capreomycin sulphate.

Urinary tract anti-infective agents

Quinolones: SAR of quinolones, Nalidixic Acid, Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin

Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine.

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Antiviral agents: Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.

UNIT – IV **08 Hours**

Antifungal agents:

Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.

Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconozole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.

Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine.

Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin.

Sulphonamides and Sulfones

Historical development, chemistry, classification and SAR of Sulfonamides:

Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*, Sulphapyridine, Sulfamethoxaole*, Sulphadiazine, Mefenide acetate, Sulfasalazine.

Folate reductase inhibitors: Trimethoprim*, Cotrimoxazole.

Sulfones: Dapsone*.

UNIT – V **07 Hours**

Introduction to Drug Design

Various approaches used in drug design.

Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammet's electronic parameter, Tafts steric parameter and Hansch analysis.

Pharmacophore modeling and docking techniques.

Combinatorial Chemistry: Concept and applications of combinatorial chemistry: solid phase and solution phase synthesis.

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

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PS602; PHARMACOLOGY - III

B.Pharm. III Year II Sem. **L T/P/ C**
3 1/0/ 4

Course Objectives: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on respiratory and gastrointestinal system, infectious diseases, immuno-pharmacology and in addition, emphasis on the principles of toxicology and chronopharmacology.

Course Outcomes: Upon completion of this course the student should be able to:

- Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
- Comprehend the principles of toxicology and treatment of various poisonings and appreciate correlation of pharmacology with related medical sciences.

UNIT- I **10 hours**

1. **Pharmacology of drugs acting on Respiratory system**
   a. Anti -asthmatic drugs
   b. Drugs used in the management of COPD
   c. Expectorants and antitussives
   d. Nasal decongestants
   e. Respiratory stimulants
2. **Pharmacology of drugs acting on the Gastrointestinal Tract**
   a. Antiulcer agents.
   b. Drugs for constipation and diarrhoea.
   c. Appetite stimulants and suppressants.
   d. Digestants and carminatives.
   e. Emetics and anti-emetics.

UNIT – II **10 hours**

Chemotherapy

a. General principles of chemotherapy.
b. Sulfonamides and cotrimoxazole.
c. Antibiotics - Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides

UNIT – III **10 hours**

Chemotherapy

a. Antitubercular agents
b. Antileprotic agents
c. Antifungal agents
d. Antiviral drugs
e. Anthelmintics
f. Antimalarial drugs
g. Antiamoebic agents

UNIT – IV **08 hours**

1. **Chemotherapy**
   a. Urinary tract infections and sexually transmitted diseases.
   Chemotherapy of malignancy.

2. **Immunopharmacology**
    a. Immunostimulants
    b. Immunosuppressant
    c. Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars

UNIT – V **07 hours**

Principles of toxicology

a. Definition and basic knowledge of acute, subacute and chronic toxicity.
b. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity
c. General principles of treatment of poisoning
d. Clinical symptoms and management of barbiturates, morphine, organ ophosphosphorus compound and lead, mercury and arsenic poisoning.

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology,
2. Churchill Livingstone Elsevier
3. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
4. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
5. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams & Wilkins
6. Mycek M. J, Gelnet S. B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology
7. K. D. Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
8. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R. Craig& Robert,
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata,
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan,
11. N. Udupa and P.D. Gupta, Concepts in Chronopharmacology.

PS603: HERBAL DRUG TECHNOLOGY

B.Pharm. III Year II Sem. **L T/P/ C**
3 1/0/ 4

Course Objectives: This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs

Course Outcomes: Upon completion of this course the student should be able to:

1. understand raw material as source of herbal drugs from cultivation to herbal drug product
2. know the WHO and ICH guidelines for evaluation of herbal drugs
3. know the herbal cosmetics, natural sweeteners, nutraceuticals
4. appreciate patenting of herbal drugs, GMP .

UNIT – I **6 Hours**

1. **Herbs as raw materials**

Definition of herb, herbal medicine, herbal drug preparation Source of Herbs
Selection, identification and authentication of herbal materials Processing of herbal raw material

2. **Biodynamic Agriculture**

Good agricultural practices in cultivation of medicinal plants including Organic farming.
Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

3. **General Introduction to Herbal Industry**

Herbal drugs industry: Present scope and future prospects.
A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.

UNIT – II **7 Hours**

1. **Nutraceuticals**

General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.
Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina

2. **Herbal-Drug and Herb-Food Interactions:** General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

UNIT - III **10 Hours**

1. **Herbal Cosmetics**

Principles and preparation of herbal cosmetics formulations- Shampoos, Dyes, face creams, tooth pastes and Bleaching agents.

2. **Herbal excipients:**

Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

3. **Herbal formulations :**

Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

UNIT – IV **10 Hours**

1. **Evaluation of Drugs** WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs.
2. **Patenting and Regulatory requirements of natural products:**
    a. Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy
    b. Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.
3. **Regulatory Issues** - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.

UNIT – V **07 Hours**

S**chedule T – Good Manufacturing Practice of Indian systems of medicine** Components of GMP (Schedule – T) and its objectives

Infrastructural requirements, working space, storage area, machinery and equipment, standard operating procedures, health and hygiene, documentation and records.

Recommended Books: (Latest Editions)

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr. S.H. Ansari
5. Pharmacognosy & Phytochemistry by V.D. Rangari
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.
8. Herbal drug Technology. By SS Agrawal and M Paridhavi
9. Indian Medicinal Plants A compendium of 500 species Vol 1, 11, 111, 1V & V By Arya vaidys sala , Universities Press

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PS604: BIOPHARMACEUTICS AND PHARMACOKINETICS

B.Pharm. III Year II Sem. **L T/P/ C**
3 1/0/ 4

Course Objectives: This subject is designed to impart knowledge and skills necessary for dose calculations, dose adjustments and to apply Biopharmaceutics theories in practical problem solving. Basic theoretical discussions of the principles of Biopharmaceutics and pharmacokinetics are provided to help the students' to clarify the concepts.

Course Outcomes: Upon completion of the course student shall be able to:

- Understand the basic concepts in biopharmaceutics and pharmacokinetics.
- Use plasma data and derive the pharmacokinetic parameters to describe the process of drug absorption, distribution, metabolism and elimination.
- Critically evaluate biopharmaceutic studies involving drug product equivalency
- Design and evaluate dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters.
- Detect potential clinical pharmacokinetic problems and apply basic pharmacokinetic principles to solve them

UNIT – I **10 Hours**

Introduction to Biopharmaceutics

Absorption: Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from Non per oral extra-vascular routes, **Distribution:** Distribution of drugs Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs

UNIT – II **10 Hours**

Metabolism & Excretion: Drug metabolism and basic understanding of metabolic pathways. Renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs

Bioavailability and Bioequivalence: Objectives of bioavailability studies, absolute and relative bioavailability, measurement of bioavailability, in-vitro drug dissolution models, in-vitro, in-vivo correlations, bioequivalence studies, methods to enhance the bioavailability.

UNIT – III **10 Hours**

Pharmacokinetics:

Introduction to Pharmacokinetics models, Compartment models, Non-compartment models, physiological models, One compartment open model. a. Intravenous Injection (Bolus) b. Intravenous infusion, extra vascular administrations, calculations of Ka, K_E. From plasma and urinary excretion data

UNIT – IV **08 Hours**

Multicompartment models: Two compartment open model. IV bolus

Multiple – Dosage Regimens:

a). Repititive Intravenous injections – One Compartment Open Model

b). Repititive Extravascular dosing – One Compartment Open model

UNIT – V **07 Hours**

Nonlinear Pharmacokinetics: a. Introduction, b. Factors causing Non-linearity. c. Michaelis-menton method of estimating parameters, Biotransformation of drugs

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Recommended Books: (Latest Editions)

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.
2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B. C. YU 4th edition, Prentice-Hall International edition. USA
4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B. Jaiswal, Vallabh Prakashan Pitampura, Delhi
5. Fundamentals of Biopharmaceutics and pharmacokinetics by Dr. V. Venkateshwarlu
6. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.
7. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
8. Biopharmaceutics; By Swarbrick
9. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and
10. Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
11. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
12. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987.
13. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvania.

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PS605: BP605T PHARMACEUTICAL QUALITY ASSURANCE
(Open Elective - II)

B.Pharm. III Year II Sem. **L T/P/ C**
3 1/0/ 4

Course Objectives: This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It covers the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs.

Course Outcomes: Upon completion of the course student shall be able to:

- Understand the cGMP aspects in a pharmaceutical industry
- Appreciate the importance of documentation
- Understand the scope of quality certifications applicable to pharmaceutical industries
- Understand the responsibilities of QA & QC departments

UNIT – I **10 Hours**

1. Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP

2. Total Quality Management (TQM): Definition, elements, philosophies

3. ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines **Quality by design 4. (QbD)**: Definition, overview, elements of QbD program, tools

5. ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration

6. NABL accreditation: Principles and procedure

UNIT – II **10 Hours**

1. Organization and personnel: Personnel responsibilities, training, hygiene and personal records. **Premises:** Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.

2. Equipments and raw materials: Equipments selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.

UNIT – II **10 Hours**

Quality Control: Quality control test for containers, rubber closures and secondary packing materials.

Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities.

UNIT – IV **08 Hours**

1. Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.

2. Document maintenance in pharmaceutical industry: Batch Formula Record, Master Formula. Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

UNIT – V **07 Hours**

1. Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.

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2. Warehousing: Good warehousing practice, materials management

Recommended Books: (Latest Edition)

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and related materials Vol I WHO Publications.
4. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total Quality Management – Sadhank G Ghosh
7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
8. Good laboratory Practices – Marcel Deckker Series
9. ICH guidelines, ISO 9000 and 14000 guidelines

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PS606: PHARMACEUTICAL BIOTECHNOLOGY
(Open Elective - II)

B.Pharm. III Year II Sem. **L T/P/ C**
3 1/0/ 4

Course Objectives:

- Biotechnology has a long promise to revolutionize the biological sciences and technology.
- Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting.
- Biotechnology is leading to new biological revolutions in diagnosis, prevention and cure of diseases, new and cheaper pharmaceutical drugs.
- Biotechnology has already produced transgenic crops and animals and the future promises lot more.
- It is basically a research-based subject.

Course Outcomes: Upon completion of the subject student shall be able to;

- Understanding the importance of Immobilized enzymes in Pharmaceutical Industries
- Genetic engineering applications in relation to production of pharmaceuticals
- Importance of Monoclonal antibodies in Industries
- Appreciate the use of microorganisms in fermentation technology

UNIT – I **10 Hours**

a. Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.
b. Enzyme Biotechnology- Methods of enzyme immobilization and applications.
c. Biosensors- Working and applications of biosensors in Pharmaceutical Industries.
d. Brief introduction to Protein Engineering.
e. Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.
f. Basic principles of genetic engineering.

UNIT – II **10 Hours**

a. Study of cloning vectors, restriction endonucleases and DNA ligase.
b. Recombinant DNA technology. Application of genetic engineering in medicine.
c. Application of r DNA technology and genetic engineering in the products:
d. Interferon b) Vaccines- hepatitis- B c) Hormones- Insulin.
e. Brief introduction to PCR

Types of immunity- humoral immunity, cellular immunity

UNIT – III **10 Hours**

a. Structure of Immunoglobulins
b. Structure and Function of MHC
c. Hypersensitivity reactions, Immune stimulation and Immune suppressions.
d. General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.
e. Storage conditions and stability of official vaccines
f. Hybridoma technology- Production, Purification and Applications

UNIT – IV **08 Hours**

a. Immuno blotting techniques- ELISA, Western blotting, Southern blotting.
b. Genetic organization of Eukaryotes and Prokaryotes
c. Microbial genetics including transformation, transduction, conjugation, plasmids and transposons.

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d. Introduction to Microbial biotransformation and applications.
e. Mutation.

UNIT – V **07 Hours**

a. Types of mutation/mutants
b. Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring.
c. Large scale production fermenter design and its various controls.
d. Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,

Recommended Books (Latest edition):

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications
2. of Recombinant DNA: ASM Press Washington D.C.
3. RA Goldshy et. al., Kuby Immunology.
4. J. W. Goding: Monoclonal Antibodies.
5. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry.
6. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.
7. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
8. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi

PS607: BIOINFORMATICS
(Open Elective - II)

B.Pharm. III Year II Sem. **L T/P/ C**
3 1/0/ 4

Course Objective: This subject is design to impart fundamental knowledge on the principles of bioinformatics

Course Outcomes: Upon completion of the course the student able to understand

- Foundation of bioinformatics
- Sequence comparisons methods
- Genomic applications
- Proteomic and metabolic applications.

UNIT - I
Foundations of bioinformatics
1.1 Bioinformatics- a historical perspective
1.2 Bioinformaticss data- nucleic acid sequence, protein sequence, protein structure, genome variation data, gene expression data, proteomic data, metabolic pathways and networks
1.3 Bioinformatics tools and resources- free online tolls, downloadable free tools, software pakags, bioinformatics web portals
1.4 Role of internet in Bioinformatics.

UNIT - II
Sequence comparison methods
2.1 Basics of sequence alignment: Match, mismatch, gaps, scoring an alignment (gap penalties (linear & affine gap penalties), sequence relationships (sequence identity, similarity, homology, orthologs, paralogs & xenologs)
2.2 DNA Vs protein sequence alignment (permissible replacement, similarity score, scoring matrices (PAM & BLOSUM)
2.3 multiple-sequence alignment (MSA): significance of MSA

UNIT - III
Genomic Applications:
3.1 Bioinformatics for genome sequencing, first and next generation methods of genome sequencing, de-novo and reference based genome sequencing, genome assembly (reads, contigs &scaffolds)
3.2 Transcript- profiling: expression microarrays (gene array& oligo array), transcriptome sequencing and RNA- seq analysis small RNA sequencing and analysis

UNIT - IV
4.1 Genome maps an markers: identification of molecular makers (SSR, STS & SNP markers), linkage Vs physical maps, displaying genome annotation using genome browsers
4.2 Medical application of bioinformatics –understanding diseases and identification of disease genes, disease diagnostics, overview of drug discovery, pharmacogenomics.

UNIT - V
Proteomic and metabolomic applications:
5.1 Protein profiling (2D gels, protein fingerprinting & identification), protein structure analysis
5.2 Protein structure: structure visualization
5.3 Protein: secondary and tertiary structure prediction (homology modelling)

Recommended Books (Latest edition):

1. Bioinformatics by B. G. Gurran, R. J. Walker, S.C. Bhatia. CBS Publishers.
2. Bioinformatics: Skills & applications by Rastogi, CBS Publishers
3. Bioinformatics: Sequence & genome analysis by mount, CBS Publishers
4. Bioinformatics and bioprogramming by CN Chaveli
5. Bioinformatics (Basics, alogerthmas and applications by Ruchi singh and Richa Sharma
6. Essential Bioinformatics Jinxiong

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PS608: SCREENING METHODS IN PHARMACOLOGY
(Open Elective - II)

B.Pharm. III Year II Sem. **L T/P/ C**
3 1/0/ 4

Course Objectives: The student is going to study about various techniques involved in screening of drugs for various pharmacological activities and guidelines for handling animals

Course Outcomes: This subject is designed to impart the knowledge on preclinical evaluation of drugs and recent experimental techniques in the drug discovery and development. The subject content helps the student to understand the maintenance of laboratory animals as per the guidelines. The expected outcome are – the students will know how to handle animals and know about various techniques for screening of drugs for different pharmacological activities and guidelines for regulations involved in screening of new drug molecules on animals.

UNIT - I
Care, handling and breeding technique of laboratory animals. Regulations for laboratory animals, CPSCEA guidelines, alternative to animal studies.

UNIT - II
Toxiciy test: OECD guidelines, determination of LD_{50}, acute, sub-acute and chronic toxicity studies.

UNIT - III
Organization of screening for pharmacological activity of new substances with emphasis on the evaluation of antipsychotics, antiepileptics and antidepressants.

UNIT - IV
Screening methods for anti-diabetic, antiulcer, CHF and anti-hypertensive drugs.

UNIT - V
Screening methods for anti-inflammatory, analgesics and antipyretic drugs.

Recommended Books (Latest edition):

1. Biological standardization by J.H. Burn D.J. Finney and I.G. Goodwin.
2. Screening methods in Pharmacology by Robert Turner. A.
3. Methods in Pharmacology by Arnold Schwartz.
4. Pharmacological screening methods and Toxicology by A Srinivasa Rao and N.Bhagya Lakshmi
5. Fundamentals of experimental Pharmacology by M.N. Ghosh.
6. Experimental Pharmacology for undergraduates by M C Prabhakara.
7. Drug discovery and Evaluation by Vogel H.G.
8. Experimental Pharmacology by R.K. Goyal.
9. Preclinical evaluation of new drugs by S.K. Gupta.
10. Handbook of Experimental Pharmacology, SK. Kulkarni.
11. Practical Pharmacology and Clinical Pharmacy, SK. Kulkarni, 3rd Edition.
12. Screening Methods in Pharmacology, Robert A. Turner.

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PS609: MEDICINAL CHEMISTRY- III LAB

B.Pharm. III Year II Sem. **L T/P/ C**
0 0/4/ 2

1. **Preparation of drugs and intermediates**
   a. Sulphanilamide
   b. 7-Hydroxy, 4-methyl coumarin
   c. Chlorobutanol
   d. Triphenyl imidazole
   e. Tolbutamide
   f. Hexamine

2. **Assay of drugs**
   a. Isonicotinic acid hydrazide
   b. Chloroquine
   c. Metronidazole
   d. Dapsone
   e. Chlorpheniramine maleate
   f. Benzyl penicillin

3. Preparation of medicinally important compounds or intermediates by Microwave irradiation technique
4. Drawing structures and reactions using chem draw®
5. Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

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PS610: PHARMACOLOGY - III LAB

B.Pharm. III Year II Sem. **L T/P/ C**
0 0/4/ 2

List of Experiments:

1. Dose calculation in pharmacological experiments
2. Antiallergic activity by mast cell stabilization assay
3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.
4. Study of effect of drugs on gastrointestinal motility
5. Effect of agonist and antagonists on guinea pig ileum
6. Estimation of serum biochemical parameters by using semi- autoanalyser
7. Effect of saline purgative on frog intestine
8. Insulin hypoglycemic effect in rabbit
9. Test for pyrogens (rabbit method)
10. Determination of acute oral toxicity (LD50) of a drug from a given data
11. Determination of acute skin irritation / corrosion of a test substance
12. Determination of acute eye irritation / corrosion of a test substance
13. Calculation of pharmacokinetic parameters from a given data
14. Biostatistics methods in experimental pharmacology (student's t test, ANOVA)
15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

**Experiments are demonstrated by simulated experiments/videos*

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams & Wilkins
5. Mycek M. J, Gelnet S. B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology
6. K. D. Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R. Craig & Robert,
8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata,
9. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan,
10. N. Udupa and P.D. Gupta, Concepts in Chronopharmacology.

PS611: HERBAL DRUG TECHNOLOGY LAB

B.Pharm. III Year II Sem. **L T/P/ C**
0 0/4/ 2

List of Experiments:

1. To perform preliminary phytochemical screening of crude drugs.
2. Evaluation of excipients of natural origin
3. Incorporation of prepared and standardized extract in cosmetics formulations like creams, lotions, Shampoos and their evaluation.
4. Incorporation of prepared and standardized extract in cosmetics formulations like Syrups, Mixtures and tablets and their evaluations as per pharmacopoeial requirements
5. Monograph analysis of herbal drugs from recent Pharmacopoeias
6. Determination of Aldehyde content
7. Determination of phenolic content
8. Determination of total alkaloids

Recommended Books: (Latest Editions)

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari
5. Pharmacognosy & Phytochemistry by V.D.Rangari
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

***MC600: HUMAN VALUES AND PROFESSIONAL ETHICS**

B.Pharm. III Year II Sem. **L T/P/ C**
1 0/0/ 0

Course Objective: To enable the students to imbibe and internalize the Values and Ethical Behavior in the personal and Professional lives.

Course Outcome: The students will understand the importance of Values and Ethics in their personal lives and professional careers. The students will learn the rights and responsibilities as an employee, team member and a global citizen.

UNIT - I

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

UNIT - II

Basic Theories: Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

UNIT - III

Professional ethics in pharmacy: general introduction to code of pharmaceutical ethics, objectives, pharmacists in relation to his job, his trade, to his profession and relation to medicinal professions. Pharmacists oath.

UNIT - IV

Work Place Rights & Responsibilities, Ethics in changing domains of Research, Engineers and Managers; Organizational Complaint Procedure, difference of Professional Judgment within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation.

Ethics in changing domains of research - The US government wide definition of research misconduct, research misconduct distinguished from mistakes and errors, recent history of attention to research misconduct, the emerging emphasis on understanding and fostering responsible conduct, responsible authorship, reviewing & editing.

UNIT - V

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

TEXT BOOKS:

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

REFERENCE BOOKS

1. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e , Cengage learning, 2015.
2. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.
3. Forensic Pharmacy by Dr.Kokate
4. Forensic Pharmacy by Bhaskar Chaurasia

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. PHARMACY IV YEAR COURSE STRUCTURE AND SYLLABUS

Effective from Academic Year 2017-18 Admitted Batch

IV Year I Semester

S.No	Course Code	Course Title	L	T	P	Credits
1	PS701	Instrumental Methods of Analysis	3	1	0	4
2	PS702	Industrial Pharmacy-II	3	1	0	4
3	PS703	Pharmacy Practice	3	1	0	4
4	PS704	Novel Drug Delivery Systems	3	1	0	4
5	 PS705 PS706 PS707 PS708	**Open Elective - III** i. Pharmaceutical Marketing ii. Pharmaceutical Regulatory Science iii. Pharmacovigilance iv. Quality Control and Standardization of Herbals	3	1	0	4
6	PS709	Instrumental Methods of Analysis Lab	0	0	4	2
7	PS710	Practice School	0	0	4	2
8	PS711	Industrial Training	0	0	2	1
		Total	**15**	**5**	**10**	**25**

IV Year II Semester

S.No	Course Code	Course Title	L	T	P	Credits
1	PS801	Biostatistics and Research Methodology	3	1	0	4
2	PS802	Social and Preventive Pharmacy	3	1	0	4
3	PS803	Pharmaceutical Jurisprudence	3	0	0	3
4	 PS804 PS805 PS806 PS807	**Open Elective - IV** i. Computer Aided Drug Design ii. Nano Technology iii. Experimental Pharmacology iv. Advanced Instrumentation Techniques	3	1	0	4
5	PS808	Project Work	0	0	6	3
		Total	**12**	**3**	**6**	**18**

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PS701: INSTRUMENTAL METHODS OF ANALYSIS

B.Pharm. IV Year I Sem. L/T/P/C 3/1/0/ 4

Course Objectives: This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

Course Outcomes: Upon completion of the course the student shall be able to:

- Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
- Understand the chromatographic separation and analysis of drugs.
- Perform quantitative & qualitative analysis of drugs using various analytical instruments.

UNIT – I **10 Hours**

1. **UV Visible spectroscopy**

Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations.

Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors-Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode.

Applications - Spectrophotometric titrations, Single component and multi component analysis

2. **Fluorimetry**

Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications

UNIT – II **10 Hours**

1. **IR spectroscopy**
   Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations
   Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermistor, Pyroelectric detector and applications
2. **Flame Photometry** - Principle, interferences, instrumentation and applications
3. **Atomic absorption spectroscopy** - Principle, interferences, instrumentation and applications
4. **Nepheloturbidometry** - Principle, instrumentation and applications

UNIT – III **10 Hours**

Introduction to chromatography

1. **Adsorption and partition column chromatography**- Methodology, advantages, disadvantages and applications.
2. **Thin layer chromatography**- Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications.
3. **Paper chromatography**- Introduction, methodology, development techniques, advantages, disadvantages and applications
4. **Electrophoresis**– Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications

UNIT – IV **08 Hours**

1. **Gas chromatography** - Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications

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2. **High performance liquid chromatography (HPLC)** - Introduction, theory, instrumentation, advantages and applications.

UNIT – V **07 Hours**

1. **Ion exchange chromatography** - Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications
2. **Gel chromatography** - Introduction, theory, instrumentation and applications
3. **Affinity chromatography** - Introduction, theory, instrumentation and applications

Recommended Books (Latest Editions):

1. Instrumental Methods of Chemical Analysis by B. K Sharma
2. Organic spectroscopy by Y. R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

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PS702: INDUSTRIAL PHARMACY - II

B.Pharm. IV Year I Sem. L/T/P/C 3/1/0/ 4

Course Objectives: This course is designed to impart fundamental knowledge on pharmaceutical product Commercialization from laboratory to market

Course Outcomes: Upon completion of the course, the student shall be able to:

- Know the process of pilot plant and scale up of pharmaceutical dosage forms
- Understand the process of technology transfer from lab scale to commercial batch
- Know different laws and acts that regulate pharmaceutical industry in India and US
- Understand the approval process and regulatory requirements for drug products

UNIT – I **10 Hours**

Pilot plant scale up techniques: General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to Platform technology

UNIT – II **10 Hours**

Technology development and transfer: WHO guidelines for Technology Transfer: Terminologies, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packing materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TOT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; Technology of Transfer (TOT) related documentation - confidentiality agreements, licensing, MoUs, legal issues

UNIT – III **10 Hours**

1. **Regulatory affairs:** Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals
2. **Regulatory requirements for drug approval:** Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.

UNIT – IV **08 Hours**

Quality management systems: Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by design, Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP

UNIT – V **07 Hours**

Indian Regulatory Requirements: Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Common Technical Document (CTD), Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.

Recommended Books: (Latest Editions)

1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http://en.wikipedia.org/wiki/Regulatory_Affairs.
2. International Regulatory Affairs Updates, 2005. available at http://www.iraup.com/about.php

3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' 2nd Edition.
4. Regulatory Affairs brought by learning plus, inc. available at http.//www.cgmp.com/ra.htm.
5. Industrial Pharmacy by Roopa K Khar, S. P Vyas, Farhan J Ahmed, Gaurav K Jain, 4th Edition

PS703: PHARMACY PRACTICE

B.Pharm. IV Year I Sem. L/T/P/C 3/1/0/ 4

Course Objectives: In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care. In community pharmacy, students will be learning various skills such as dispensing safe medication and patient counseling.

Course Outcomes: Upon completion of the course, the student shall be able to:

- Know various drug distribution methods in a hospital
- Appreciate the pharmacy stores management and inventory control
- Monitor drug therapy of patient through medication chart review and clinical review
- Know pharmaceutical care services
- do patient counseling in community pharmacy

UNIT – I **10 Hours**

1. **Hospital and it's organization**
   Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions.
2. **Hospital pharmacy and its organization**
   Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.
3. **Community Pharmacy**
   Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.

UNIT – II **10 Hours**

1. **Drug distribution system in a hospital**
   Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, dispensing of drugs to ambulatory patients, and Dispensing of controlled drugs.
2. **Therapeutic drug monitoring**
   Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring.
3. **Community pharmacy management**
   Financial, materials, staff, and infrastructure requirements.

UNIT – III **10 Hours**

1. **Drug information services**
   Drug and Poison information centre, Sources of drug information, Computerized services, and storage and retrieval of information.
2. **Patient counseling**
   Definition of patient counseling; steps involved in patient counseling, and Special cases that require the pharmacist
3. **Education and training program in the hospital**
   Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education.

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UNIT – IV **08 Hours**

1. **Clinical Pharmacy**
   Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care.
2. **Over the counter (OTC) sales**
   Introduction and sale of over the counter, and Rational use of common over the counter medications.

UNIT – V **07 Hours**

Drug store management and inventory control

Organization of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure

Recommended Books (Latest Edition):

1. Merchant S. H. and Dr. J. S. Quadry. A textbook of hospital pharmacy, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001.
2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. A textbook of Clinical Pharmacy Practice- essential concepts and skills, 1st ed. Chennai: Orient Longman Private Limited; 2004.
3. William E. Hassan. Hospital pharmacy, 5th ed. Philadelphia: Lea & Febiger; 1986.
4. Tipnis Bajaj. Hospital Pharmacy, 1st ed. Maharashtra: Career Publications; 2008.
5. Scott LT. Basic skills in interpreting laboratory data, 4th ed. American Society of Health System Pharmacists Inc; 2009.
6. Parmar N. S. Health Education and Community Pharmacy, 18th ed. India: CBS Publishers & Distributers; 2008.

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PS704: NOVEL DRUG DELIVERY SYSTEMS

B.Pharm. IV Year I Sem. L/T/P/C 3/1/0/ 4

Course Objectives: This subject is designed to impart basic knowledge on the area of novel drug delivery systems.

Course Outcomes: Upon completion of the course student shall be able:

- To understand various approaches for development of novel drug delivery systems.
- To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation

UNIT – I **10 Hours**

1. **Controlled drug delivery systems:** Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design-controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations
2. **Polymers:** Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.

UNIT – II **10 Hours**

1. **Microencapsulation:** Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications
2. **Mucosal Drug Delivery system:** Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems
3. **Implantable Drug Delivery Systems:** Introduction, advantages and disadvantages, concept of implantsand osmotic pump

UNIT – III **10 Hours**

1. **Transdermal Drug Delivery Systems:** Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches
2. **Gastroretentive drug delivery systems:** Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications
3. **Nasopulmonary drug delivery system:** Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers

UNIT – IV **08 Hours**

Nanotechnology and its Concepts: Concepts and approaches for targeted drug delivery systems, advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications

UNIT – V **07 Hours**

1. **Ocular Drug Delivery Systems:** Introduction, intra ocular barriers and methods to overcome – Preliminary study, ocular formulations and ocuserts
2. **Intrauterine Drug Delivery Systems**: Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications

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Recommended Books: (Latest Editions)

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.
3. Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim
4. N. K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, 1st edition 1997 (reprint in 2001).
5. S. P. Vyas and R. K. Khar, Controlled Drug Delivery - concepts and advances, Vallabh Prakashan, New Delhi, 1st edition 2002.

PS705: PHARMACEUTICAL MARKETING (Open Elective - III)

B.Pharm. IV Year I Sem. L/T/P/C 3/1/0/ 4

Course Objectives: The pharmaceutical industry not only needs highly qualified researchers, chemist, technical people but also requires skilled managers who can take the industry forward by managing and taking the complex decisions which are imperative for the growth of the industry. Sales & Marketing which grooms the people for taking a challenging role in Sales and Product management.

Course Outcome: Provide an understanding of marketing concepts and techniques and the application of the same in the pharmaceutical industry.

UNIT – I **10 Hours**

Marketing: Definition, general concepts, and scope of marketing; Distinction between marketing & selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior.

Pharmaceutical market: Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation& targeting. Consumer profile; Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist. Analyzing the Market; Role of market research.

UNIT – II **10 Hours**

Product decision: Meaning, Classification, product line and product mix decisions, product life cycle, product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labeling decisions, Product management in pharmaceutical industry.

UNIT – III **10 Hours**

Promotion: Meaning and methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.

UNIT – IV **10 Hours**

Pharmaceutical marketing channels: Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physical distribution management.

Professional sales representative (PSR): Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR.

UNIT – V **10 Hours**

Pricing: Meaning, importance, objectives, determinants of price; pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order) and NPPA (National Pharmaceutical Pricing Authority).

Emerging concepts in marketing: Vertical & Horizontal Marketing; Rural Marketing; Consumerism; Industrial Marketing; Global Marketing.

Recommended Books: (Latest Editions)

1. Philip Kotler and Kevin Lane Keller: Marketing Management, Prentice Hall of India, New Delhi
2. Walker, Boyd and Larreche: Marketing Strategy- Planning and Implementation, Tata McGraw Hill, New Delhi.
3. Dhruv Grewal and Michael Levy: Marketing, Tata McGraw Hill

4. Arun Kumar and N Menakshi: Marketing Management, Vikas Publishing, India
5. Rajan Saxena: Marketing Management; Tata MC Graw-Hill (India Edition)
6. Ramaswamy, U.S & Nanakamari, S: Marketing Management: Global Perspective, Indian Context, Macmillan India, New Delhi.
7. Shanker, Ravi: Service Marketing, Excell Books, New Delhi
8. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series) Excel Publications.

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PS706: PHARMACEUTICAL REGULATORY SCIENCE (Open Elective - III)

B.Pharm. IV Year I Sem. L/T/P/C 3/1/0/ 4

Course Objectives: This course is designed to impart the fundamental knowledge on the regulatory requirements for approval of new drugs, drug products in regulated countries like US, EU, Japan, Australia and Canada. It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products in regulated countries.

Course Outcomes: Upon completion of the subject student shall be able to:

- Know about the process of drug discovery and development
- Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
- Know the regulatory approval process and their registration in Indian and international markets

UNIT – I **10 Hours**

New Drug Discovery and development

Stages of drug discovery, Drug development process, pre-clinical studies, non-clinical activities, clinical studies, Innovator and generics, Concept of generics, Generic drug product development.

UNIT – II **10 Hours**

Regulatory Approval Process: Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA) in US. Changes to an approved NDA / ANDA.

Regulatory authorities and agencies: Overview of regulatory authorities of United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)

UNIT – III **10 Hours**

Registration of Indian drug product in overseas market: Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical Document (eCTD), ASEAN Common Technical Document (ACTD) research.

UNIT – IV **08 Hours**

Clinical trials: Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance - safety monitoring in clinical trials

UNIT – V **07 Hours**

Regulatory Concepts: Basic terminologies, guidance, guidelines, regulations, laws and acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book

Recommended books (Latest edition):

1. Drug Regulatory Affairs by Sachin Itkar, Dr. N. S. Vyawahare, Nirali Prakashan.
2. The Pharmaceutical Regulatory Process, 2nd Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol.185. Informa Health care Publishers.
3. New Drug Approval Process: Accelerating Global Registrations by Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol.190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc.

5. FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics /edited by Douglas J. Pisano, David Mantus.
6. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143
7. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance by Fay A. Rozovsky and Rodney K. Adams
8. Principles and Practices of Clinical Research, 2nd Edition Edited by John I. Gallin and Frederick P. Ognibene
9. Drugs: From Discovery to Approval, 2nd Edition by Rick N

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PS707: PHARMACOVIGILANCE (Open Elective - III)

B.Pharm. IV Year I Sem. L/T/P/C 3/1/0/ 4

Course Objective: This paper will provide an opportunity for the student to learn about development of pharmacovigilance as a science, basic terminologies used in pharmacovigilance, global scenario of Pharmacovigilance, train students on establishing pharmacovigilance programme in an organization, various methods that can be used to generate safety data and signal detection.

Course Outcomes: At completion of this paper it is expected that students will be able to (know, do, and appreciate):

- Why drug safety monitoring is important?
- History and development of pharmacovigilance
- National and international scenario of pharmacovigilance
- International standards for classification of diseases and drugs
- Adverse drug reaction reporting systems and communication in pharmacovigilance
- Data during pre-clinical, clinical and post approval.
- Pharmacovigilance Program of India (PvPI)
- ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning

UNIT - I **10 Hours**

Introduction to Pharmacovigilance:

a) History and development of Pharmacovigilance
b) Importance of safety monitoring of Medicine
c) WHO international drug monitoring programme
d) Pharmacovigilance Program of India (PvPI)

Introduction to adverse drug reactions:

a) Definitions and classification of ADRs
b) Detection and reporting
c) Methods in Causality assessment
d) Severity and seriousness assessment
e) Predictability and preventability assessment

Basic terminologies used in pharmacovigilance:

a) Terminologies of adverse medication related events
b) Regulatory terminologies

UNIT – II **10 hours**

Drug and disease classification:

a) Anatomical, therapeutic and chemical classification of drugs
b) International classification of diseases
c) Daily defined doses

Drug dictionaries and coding in pharmacovigilance:

a) WHO adverse reaction terminologies
b) MedDRA and Standardized MedDRA queries
c) WHO drug dictionary

Information resources in pharmacovigilance:

a) Basic drug information resources

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Establishing pharmacovigilance programme:

a) Establishing in a hospital
b) Establishment & operation of drug safety department in industry
c) Contract Research Organizations (CROs)

UNIT – III **10 Hours**

Vaccine safety surveillance:

a) Vaccine Pharmacovigilance
b) Vaccination failure
c) Adverse events following immunization

Pharmacovigilance methods:

a) Passive surveillance – Spontaneous reports and case series
b) Stimulated reporting
c) Active surveillance – Sentinel sites, drug event monitoring and registries
d) Comparative observational studies – Cross sectional study, case control study and cohort study
e) Targeted clinical investigations

UNIT – IV **08 Hours**

Statistical methods for evaluating medication safety data

Safety data generation:

a) Pre-clinical phase
b) Clinical phase
c) Post approval phase

ICH Guidelines for Pharmacovigilance:

a) Organization and objectives of ICH
b) Expedited reporting
c) Individual case safety reports
d) Periodic safety update reports
e) Post approval expedited reporting
f) Pharmacovigilance planning
g) Good clinical practice in pharmacovigilance studies

UNIT – V **07 hours**

Pharmacogenomics of adverse drug reactions:

Drug safety evaluation in special population

a) Pediatrics
b) Pregnancy and lactation
c) Geriatrics

Recommended Books (Latest edition):

1. Textbook of Pharmacovigilance: S K Gupta, Jaypee Brothers, Medical Publishers.
2. Practical Drug Safety from A to Z By Barton Cobert, Pierre Biron, Jones and Bartlett Publishers.
3. Mann's Pharmacovigilance: Elizabeth B. Andrews, Nicholas, Wiley Publishers.
4. Stephens' Detection of New Adverse Drug Reactions: John Talbot, Patrick Walle, Wiley Publishers.
5. An Introduction to Pharmacovigilance: Patrick Waller, Wiley Publishers.

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6. Cobert's Manual of Drug Safety and Pharmacovigilance: Barton Cobert, Jones& Bartlett Publishers.

7. Textbook of Pharmacoepidemiolog edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy, Wiley Publishers.
8. A Textbook of Clinical Pharmacy Practice -Essential Concepts and Skills: G. Parthasarathi, Karin Nyfort Hansen, Milap C. Nahata
9. National Formulary of India
10. Text Book of Medicine by Yashpal Munjal
11. Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna
12. http://www.whoumc.org/DynPage.aspx?id=105825&mn1=7347&mn2=7259&mn3=7297
13. http://www.ich.org/
14. http://www.cioms.ch/
15. http://cdsco.nic.in/
16. http://www.who.int/vaccine_safety/en/
17. http://www.ipc.gov.in/PvPI/pv_home.html

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PS708: QUALITY CONTROL AND STANDARDIZATION OF HERBALS (Open Elective - III)

B.Pharm. IV Year I Sem. L/T/P/C 3/1/0/ 4

Course Objective: In this subject the student learns about the various methods and guidelines for evaluation and standardization of herbs and herbal drugs. The subject also provides an opportunity for the student to learn cGMP, GAP and GLP in traditional system of medicines.

Course Outcomes: Upon completion of the subject student shall be able to:

- Know WHO guidelines for quality control of herbal drugs
- Know Quality assurance in herbal drug industry
- Know the regulatory approval process and their registration in Indian and international markets
- Appreciate EU and ICH guidelines for quality control of herbal drugs

UNIT – I **10 hours**

Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms. WHO guidelines for quality control of herbal drugs. Evaluation of commercial crude drugs intended for use

UNIT – II **10 hours**

Quality assurance in herbal drug industry of cGMP, GAP, GMP and GLP in traditional system of medicine. WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines WHO Guidelines on GACP for Medicinal Plants.

UNIT – III **10 hours**

EU and ICH guidelines for quality control of herbal drugs.
Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines

UNIT – IV **08 hours**

Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products.
Preparation of documents for new drug application and export registration GMP requirements and Drugs & Cosmetics Act provisions.

UNIT – V **07 hours**

Regulatory requirements for herbal medicines.
WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems Comparison of various Herbal Pharmacopoeias.
Role of chemical and biological markers in standardization of herbal products

Recommended Books: (Latest Editions)

1. Pharmacognosy by Trease and Evans
2. Pharmacognosy by Kokate, Purohit and Gokhale
3. Rangari, V.D., Text book of Pharmacognosy and Phytochemistry Vol. I , Carrier Pub., 2006.
4. Aggrawal, S.S., Herbal Drug Technology. Universities Press, 2002.
5. EMEA. Guidelines on Quality of Herbal Medicinal Products/Traditional Medicinal Products,
6. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.
7. Shinde M.V., Dhalwal K., Potdar K., Mahadik K. Application of quality control principles to herbal drugs. International Journal of Phytomedicine 1(2009); p. 4-.

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8. WHO. Quality Control Methods for Medicinal Plant Materials, World Health Organization, Geneva, 1998. WHO. Guidelines for the Appropriate Use of Herbal Medicines. WHO Regional Publications, Western Pacific Series No 3, WHO Regional office for the Western Pacific, Manila, 1998.
9. WHO. The International Pharmacopeia, Vol. 2: Quality Specifications, 3rd edn. World Health Organization, Geneva, 1981. WHO. Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva, 1999.
10. WHO. WHO Global Atlas of Traditional, Complementary and Alternative Medicine. 2 vol. set. Vol. 1 contains text and Vol. 2, maps. World Health Organization, Geneva, 2005.
11. WHO. Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. World Health Organization, Geneva, 2004.

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PS709: INSTRUMENTAL METHODS OF ANALYSIS LAB

B.Pharm. IV Year I Sem. L/T/P/C
0/0/4/ 2

List of Experiments:

1. Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds
2. Estimation of dextrose by colorimetry
3. Estimation of sulfanilamide by colorimetry
4. Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy
5. Assay of paracetamol by UV- Spectrophotometry
6. Estimation of quinine sulfate by fluorimetry
7. Study of quenching of fluorescence
8. Determination of sodium by flame photometry
9. Determination of potassium by flame photometry
10. Determination of chlorides and sulphates by nephelo turbidometry
11. Separation of amino acids by paper chromatography
12. Separation of sugars by thin layer chromatography
13. Separation of plant pigments by column chromatography
14. Demonstration experiment on HPLC
15. Demonstration experiment on Gas Chromatography

Recommended Books (Latest Editions):

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

PS710: PRACTICE SCHOOL

B.Pharm. IV Year I Sem. L/T/P/ C
0 /0/4/ 2

Course Objectives: Practice school is an educational innovation seeking to link industry/hospital/ pharmacy experience with university instruction. The student will:

- Meet the rapidly changing needs and challenges of a professional work place.
- Acquire knowledge and skills.
- Bear an economic relevance to the society.

Course Outcome: Institutionalized linkage between university/college and industry. Student's involvement in real life projects continues internal evaluation and monitoring the faculty help by student to understand the practical issues. After successful completion of 150 hrs, the students will submit the detailed report in the following field.

Note: Any domains relevant to pharmacy can be given to students. Following domains for for reference

Industry oriented PS:
It comprises industry visits and interactions with executives to facilitate the process of learning by observations and discussions duly aided by the check list. It promotes learning by doing in various departments like production quality control and assurance, R&D etc. Taking one issue and working on it for prescribed hours and submit the report.

Hospital oriented PS:
The student is asked to visit the hospitals and work on some case studies like cardiovascular, diabetics, gastrointestinal, gynecological, pulmonary pediatric etc. related cases of some 5 to 6 to be studied and detailed data to be submitted.

Retail pharmacy-oriented PS:
The students have to visit different pharmacy shops and collect the data related to the most prescribed medicines in that area, prescription patterns, medical audit etc and submit the report.

Election of medicinal plants orientated PS:
The students have to visit medicinal plant gardens and collect some medicinal plants those are useful to various disorders and submit the report in detail about the plants they come across during their study period

Regulatory affairs: collect and analyse the regulatory affairs. Some important cases filed by drug control officers to be analysed and reported.

National poison centre: visit the local poison centre and write the relevant matter

Formulation aspects: Formulations using any equipments which otherwise are not usually used for regular practicals

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PS801: BIOSTATISTICS AND RESEARCH METHODOLOGY

B.Pharm. IV Year II Sem. L/T/P/ C
3/1/0/ 4

Course Objectives: To understand the applications of Biostatics in Pharmacy. This subject deals with descriptive statistics, Graphics, Correlation, Regression, ANOVA, Introduction to Design of Experiments, Phases of Clinical trials and Observational and Experimental studies.

Course Outcomes: Upon completion of the course the student shall be able to

- Know the operation of M.S. Excel, SPSS, R and MINITAB®, DoE (Design of Experiment)
- Know the various statistical techniques to solve statistical problems
- Appreciate statistical techniques in solving the problems.

UNIT – I **10 Hours**

Introduction: Statistics, Biostatistics, Frequency distribution

Measures of central tendency: Mean, Median, Mode- Pharmaceutical examples

Measures of dispersion: Dispersion, Range, standard deviation, Pharmaceutical problems

Correlation: Definition, Karl Pearson's coefficient of correlation, Multiple correlation -Pharmaceuticals examples

UNIT – II **10 Hours**

Regression: Curve fitting by the method of least squares, fitting the lines y= a + bx and x = a + by, Multiple regression, standard error of regression– Pharmaceutical Examples.

Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples

Parametric test: t-test (Sample, Pooled or Unpaired and Paired), ANOVA, (One way and Two way), Least Significance difference

UNIT – III **10 Hours**

Non-Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test

Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism

Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph.

Designing the methodology: Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.

UNIT – IV **8 Hours**

Introduction to Practical components of Industrial and Clinical Trials Problems: Statistical Analysis Using Excel, SPSS, MINITAB®, DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Industrial and Clinical trial approach

UNIT – V **7 Hours**

Design and Analysis of experiments:

Factorial Design: Definition, 2^2, 2^3 design. Advantage of factorial design

Response Surface methodology: Central composite design, Historical design, Optimization Techniques

Recommended Books (Latest edition):

1. Pharmaceutical Statistics - Practical and clinical applications, Sanford Bolton, Publisher Marcel Dekker Inc. New York.
2. Fundamental of Statistics – Himalaya Publishing House- S. C. Guptha
3. Design and Analysis of Experiments – PHI Learning Private Limited, R. Pannerselvam,
4. Design and Analysis of Experiments – Wiley Students Edition, Douglas and C. Montgomery

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PS802: SOCIAL AND PREVENTIVE PHARMACY

B.Pharm. IV Year II Sem. L/T/P/ C
3/1/0/ 4

Course Objectives: The purpose of this course is to introduce to students a number of health issues and their challenges. This course also introduced a number of national health programmes. The roles of the pharmacist in these contexts are also discussed.

Course Outcomes: After the successful completion of this course, the student shall be able to:

- Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the country and worldwide.
- Have a critical way of thinking based on current healthcare development.
- Evaluate alternative ways of solving problems related to health and pharmaceutical issues

UNIT – I **10 Hours**

Concept of health and disease: Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick.

Social and health education: Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention.

Sociology and health: Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health

Hygiene and health: personal hygiene and health care; avoidable habits

UNIT – II **10 Hours**

Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse

UNIT – III **10 Hours**

National health programs, its objectives, functioning and outcome of the following: HIV and AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National
programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.

UNIT – IV **08 Hours**

National health intervention programme for mother and child, national family welfare programme, national tobacco control programme, national malaria prevention program, national programme for the health care for the elderly, social health programme; role of *who in indian national program

UNIT – V **07 Hours**

Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.

Recommended Books (Latest edition):

1. Short Textbook of Preventive and Social Medicine, Prabhakara G N, 2nd Edition, 2010, ISBN: 9789380704104, JAYPEE Publications
2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy Rabindra Nath, Saha Indranil, 4th Edition, 2013, ISBN: 9789350901878, JAYPEE Publications

3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, 2014, ISBN: 9789351522331, JAYPEE Publications
4. Essentials of Community Medicine - A Practical Approach, Hiremath Lalita D, Hiremath Dhananjaya A, 2nd Edition, 2012, ISBN: 9789350250440, JAYPEE Publications
5. Park Textbook of Preventive and Social Medicine, K Park, 21st Edition, 2011, ISBN-14: 9788190128285, Banarsidas Bhanot Publishers.
6. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad

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PS803: PHARMACEUTICAL JURISPRUDENCE

B.Pharm. IV Year II Sem. L/T/P/ C
3/0/0/ 3

Course Objectives: This course is designed to impart basic knowledge on several important legislations related to the profession of pharmacy in India.

Course Outcomes: Upon completion of the course, the student shall be able to understand:

- The Pharmaceutical legislations and their implications in the development and marketing
- Various Indian pharmaceutical Acts and Laws
- The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
- The code of ethics during the pharmaceutical practice

UNIT – I **10 Hours**

Drugs and Cosmetics Act, 1940 and its rules 1945:

Objectives, Definitions, Legal definitions of schedules to the act and rules

Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties.

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs,

Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

UNIT – II **10 Hours**

Drugs and Cosmetics Act, 1940 and its rules 1945.

Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA)

Sale of Drugs - Wholesale, Retail sale and Restricted license. Offences and penalties

Labeling & Packing of drugs - General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

Administration of the act and rules - Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors

UNIT – III **10 Hours**

Pharmacy Act - 1948: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; its constitution and functions, Registration of Pharmacists, Offences and
Penalties

Medicinal and Toilet Preparation Act -1955: Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties.

Narcotic Drugs and Psychotropic substances Act-1985 and Rules: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties

UNIT – IV **08 Hours**

Study of Salient Features of Drugs and magic remedies Act and its rules: Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties

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Prevention of Cruelty to animals Act-1960: Objectives, Definitions, Institutional Animal Ethics Committee, Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties
National Pharmaceutical Pricing Authority: Drugs Price Control Order (DPCO)-2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)

UNIT – V **07 Hours**

Pharmaceutical Legislations – A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee
Code of Pharmaceutical ethics - Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath
Medical Termination of pregnancy act
Right to information Act
Introduction to Intellectual Property Rights (IPR)

Recommended books: (Latest Edition)

1. Forensic Pharmacy by B. Suresh
2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-by M. L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
7. Narcotic drugs and psychotropic substances act by Govt. of India publications
8. Drugs and Magic Remedies act by Govt. of India publication
9. Bare Acts of the said laws published by Government. Reference books (Theory)

PS804: COMPUTER AIDED DRUG DESIGN (Open Elective - IV)

B.Pharm. IV Year II Sem. L/T/P/ C
3/1/0/ 4

Course Objectives: This subject is designed to provide detailed knowledge of rational drug design process and various techniques used in rational drug design process.

Course Outcomes: Upon completion of the course, the student shall be able to understand:

- Design and discovery of lead molecules
- The role of drug design in drug discovery process
- The concept of QSAR and docking
- Various strategies to develop new drug like molecules.
- The design of new drug molecules using molecular modeling software

UNIT – I **10 Hours**

Introduction to Drug Discovery and Development: Stages of drug discovery and development

Lead discovery and Analog Based Drug Design

Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation.

Analog Based Drug Design: Bioisosterism, Classification, Bioisosteric replacement. Any three case studies

UNIT – II **10 Hours**

Quantitative Structure Activity Relationship (QSAR): SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammet's substituent constant and Tafts steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.

UNIT – III **10 Hours**

Molecular Modeling and virtual screening techniques

Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore-based Screening

Molecular docking: Rigid docking, flexible docking, manual docking, Docking based screening. De novo drug design.

UNIT – IV **08 Hours**

Informatics & Methods in drug design: Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases.

UNIT – V **07 Hours**

Molecular Modeling: Introduction to molecular mechanics and quantum mechanics. Energy Minimization methods and Conformational Analysis, global conformational minima determination.

Recommended Books (Latest Editions):

1. Robert GCK, ed., "Drug Action at the Molecular Level" University Prak Press Baltimore.
2. Martin YC. "Quantitative Drug Design" Dekker, New York.
3. Delgado JN, Remers WA eds "Wilson & Gisvolds's Text Book of Organic Medicinal & Pharmaceutical Chemistry" Lippincott, New York.
4. Foye WO "Principles of Medicinal chemistry 'Lea & Febiger.

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5. Koro Ikovas A, Burckhalter JH. “Essentials of Medicinal Chemistry” Wiley Interscience.
6. Wolf ME, ed “The Basis of Medicinal Chemistry, Burger’s Medicinal Chemistry” John Wiley & Sons, New York.
7. Patrick Graham, L., An Introduction to Medicinal Chemistry, Oxford University Press.
8. Smith HJ, Williams H, eds, “Introduction to the principles of Drug Design” Wright Boston.
9. Silverman R.B. “The organic Chemistry of Drug Design and Drug Action” Academic Press New York.

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PS805: NANO TECHNOLOGY (Open Elective - IV)

B.Pharm. IV Year II Sem. L/T/P/ C
3/1/0/ 4

Course Objectives: To develop expertise regarding suitability and evaluation of nanomaterials, able to apply the properties to the fabrication of nanopharmaceutical, evaluate the intensity of dosage forms and availability for targeting and controlled delivery.

Course Outcomes: The students should be able to select the right kind of materials, able to develop nano formulations with appropriate technologies, evaluate the product related test and for identified diseases

UNIT - I

Introduction to Nanotechnology

a. Definition of nanotechnology
b. History of nanotechnology
c. Unique properties of nanomaterials
d. Classification of nanomaterials

.

UNIT - II

Synthesis of Nanomaterials

Methods for synthesis of:

a. Gold nanoparticles
b. Magnetic nanoparticles
c. Polymeric nanoparticles
d. Self – assembly structures such as liposomes, Niosomes, micelles, aquasomes and nanoemulsions

UNIT - III

Biomedical applications of Nanotechnology

a. Nanotechnology products used for in vitro diagnostics
b. Applications in imaging and targeting.

UNIT - IV

Design of nanomaterials for drug delivery, pulmonary, nasal drug delivery, cardiovascular diseases and localized drug delivery systems.

UNIT - V

Characterization, drug release and stability studies of nanomaterials

Recommended Books (Latest Editions):

1. Nanomedicine and Nanoproducts: Applications, Disposition and Toxicology in the Human body, Eiki Igarashi, CRC press. 2015
2. Nanotechnology and Drug Delivery Volume one and two: Nanoplatforms in Drug Delivery, Jose L. Arias, CRC press
3. Nano: The Essentials: Understanding Nanosicence and Nanotechnology, T. Pradeep, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008.
4. Nanocrystals: Synthesis, Properties and Applications, C. N. R. Rao, P.J. Thomas and G.U. Kulakarni, Springer (2007)
5. Nanostructures and Nanomaterials: Synthesis, Properties and Application, Guozhong Gao, Imperial College Press (2004)

6. Nano chemistry: A Classical Approach to Nanomaterials – Royal Society for Chemistry, Cambridge, UK (2005)
7. Nanocomposite science and technology, pulickel M. Ajayan, Linda S. Schadler, paul V. Braun, Wiley-VCH Verlag, Weiheim (2003)
8. Nanoscale materials in chemistry, Edited by Kenneth J. Klabunde, John Wiley & Sons, 2009
9. Nanoparticles as Drug carriers, Vladimir P Torchiling, Imperial College Press, USA, 2006
10. Introduction to Nano Science and Technologies, Ankaneyulu Yerramilli, BS Publications. 2016

PS806: EXPERIMENTAL PHARMACOLOGY (Open Elective - IV)

B.Pharm. IV Year II Sem. L/T/P/ C
3/1/0/ 4

Course Objectives: This subject is designed to impart the knowledge on preclinical evaluation of drugs and recent experimental techniques in the drug discovery and development. The subject content helps the student to understand the maintenance of laboratory animals as per the guidelines.

Course Outcomes: Upon completion of the course the student shall be able to,

- Appraise the regulations and ethical requirement for the usage of experimental animals.
- Describe the various animals and newer screening methods used in the drug discovery
- Understand the Research methodology to be followed Bio-statistical data interpretation of the assays

UNIT - I

Laboratory Animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia

UNIT - II

Preclinical screening models: Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups

UNIT - III

Preclinical screening models: for ANS activity, sympathomimetics, sympatholytics, parasympathomimetics, parasympatholytics and skeletal muscle relaxants.

UNIT - IV

Preclinical screening models for diuretics, anticoagulants and anticancer activities

UNIT - V

Research methodology and Bio-statistics, Selection of research topic, review of literature, research hypothesis and study design, Interpretation using Student't' test and One-way ANOVA. Graphical representation of data.

Recommended Books (Latest Editions):

1. Biological standardization by J.H. Burn D.J. Finney and I.G. Goodwin.
2. Screening methods in Pharmacology by Robert Turner. A.
3. Methods in Pharmacology by Arnold Schwartz.
4. Pharmacological screening methods and Toxicology by A Srinivasa Rao and N. Bhagya Lakshmi
5. Fundamentals of experimental Pharmacology by M. N. Ghosh.
6. Experimental Pharmacology for undergraduates by M C Prabhakara.
7. Drug discovery and Evaluation by Vogel H. G.
8. Experimental Pharmacology by R. K. Goyal.
9. Preclinical evaluation of new drugs by S.K. Gupta.
10. Handbook of Experimental Pharmacology, S K. Kulkarni.
11. Practical Pharmacology and Clinical Pharmacy, S K. Kulkarni, 3rd Edition.
12. Screening Methods in Pharmacology, Robert A. Turner.

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PS807: ADVANCED INSTRUMENTATION TECHNIQUES (Open Elective - IV)

B.Pharm. IV Year II Sem. L/T/P/ C
3/1/0/ 4

Course Objectives: This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart advanced knowledge on the principles and instrumentation of spectroscopic and chromatographic hyphenated techniques. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

Course Outcomes: Upon completion of the course the student shall be able to:

- Understand the advanced instruments used and its applications in drug analysis
- Understand the chromatographic separation and analysis of drugs.
- Understand the calibration of various analytical instruments
- Know analysis of drugs using various analytical instruments.

UNIT – I **10 Hours**

Nuclear Magnetic Resonance spectroscopy

Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications

Mass Spectrometry - Principles, Fragmentation, Ionization techniques - Electron impact, chemical ionization, instrumentation and applications.

UNIT - II **10 Hours**

Thermal Methods of Analysis: Principles, instrumentation and applications of Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC)

X-Ray Diffraction Methods: Origin of X-rays, basic aspects of crystals, X-ray Crystallography, rotating crystal technique, single crystal diffraction, powder diffraction and applications.

UNIT - III **10 Hours**

Calibration and validation-as per ICH and USFDA guidelines

Calibration of following Instruments

Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, Fluorimeter, Flame Photometer, HPLC and GC

UNIT – IV **08 Hours**

Radio immune assay: Importance, various components, Principle, different methods, Limitation and Applications of Radio immuno assay

Extraction Techniques: General principle and procedure involved in the solid phase extraction and liquid-liquid extraction

UNIT – V **07 Hours**

Hyphenated techniques - LC-MS/MS, GC-MS/MS, HPTLC-MS.

Recommended Books (Latest Editions):

1. Instrumental Methods of Chemical Analysis by B. K Sharma
2. Organic spectroscopy by Y. R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar

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7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Pharmacy (PHARMACOLOGY)

COURSE STRUCTURE AND SYLLABUS
Effective from Academic Year 2017-18 Admitted Batch

I Year – I Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course I	Advanced Pharmacology – I	25	75	4	--	4
Core Course II	Clinical Pharmacology and Pharmacotherapeutics	25	75	4	--	4
Core Course III	Pharmacokinetics And Drug Metabolism	25	75	4	--	4
Core Elective I	1. Modern Pharmaceutical Analytical Techniques 2. Clinical Research and Pharmacovigilance	25	75	4	--	4
Open Elective I	1. Pharmacoepidemiology and Pharmacoeconomics 2. Drug Regulatory Affairs 3. Herbal Cosmetics Technology 4. Pharmaceutical Management 5. Pharmaceutical Formulation Technology	25	75	4	--	4
Laboratory I	Advanced Pharmacology- I Lab	25	75	--	6	3
Laboratory II	Clinical Pharmacology and Pharmacotherapeutics Lab	25	75	--	6	3
Seminar I	Seminar	100	--	--	4	2
Total Credits		**275**	**525**	**20**	**16**	**28**

I Year – II Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course IV	Advanced Pharmacology- II	25	75	4	--	4
Core Course V	Pharmacological and Toxicological Screening Methods	25	75	4	--	4
Core Course VI	Principles of Drug Discovery	25	75	4	--	4
Core Elective II	1. Quality Use of Medicines 2. Principles of Toxicology	25	75	4	--	4
Open Elective II	1. Stability of Drugs and Dosage Forms 2. Biostatistics and Research Methodology 3. Entrepreneurship Management 4. Clinical Toxicology 5. Advanced Drug Delivery Systems	25	75	4	--	4
Laboratory III	Advanced Pharmacology –II Lab	25	75	--	6	3
Laboratory IV	Advanced Screening Methods and Toxicology Lab	25	75	--	6	3
Seminar II	Seminar	100	--	--	4	2
Total Credits		**275**	**525**	**20**	**16**	**28**

II Year - I Semester

Course Title	Int. marks	Ext. marks	L	P	C
Comprehensive Viva-Voce	--	100	--	--	4
Project work Review II	100	--	--	24	12
Total Credits	**100**	**100**	--	24	**16**

II Year - II Semester

Course Title	Int. marks	Ext. marks	L	P	C
Project work Review III	100	--	--	8	4
Project Evaluation (Viva-Voce)	--	100	--	16	12
Total Credits	**100**	**100**	**--**	**24**	**16**

$ For Project review I, please refer 7.9 in R17 Academic Regulations

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmacology)

ADVANCED PHARMACOLOGY – I (Core Course I)

Course Objective:
The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. In addition, this subject helps the students to understand the concepts of drug action and mechanisms involved.

Course Outcome: Upon completion of the course the student shall be able to :

- Discuss the pathophysiology and pharmacotherapy of certain diseases
- Explain the mechanism of drug actions at cellular and molecular level
- Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases

UNIT- I
General Pharmacology:
a. Pharmacokinetics: The dynamics of drug absorption, distribution, biotransformation and elimination. Concepts of linear and non-linear compartment models. Significance of Protein binding.
b. Pharmacodynamics: Mechanism of drug action and the relationship between drug concentration and effect. Receptors, structural and functional families of receptors quantitation of drug receptors interaction and elicited effects.

UNIT-II
Neurotransmission
a. General aspects and steps involved in neurotransmission.
b. Neurohumoral transmission in autonomic nervous system (Detailed study about neurotransmitters-Adrenaline and Acetylcholine).
c. Neurohumoral transmission in central nervous system (Detailed study about neurotransmitters-histamine, serotonin, dopamine, GABA, glutamate and glycine].
d. Non adrenergic non cholinergic transmission (NANC). Cotransmission
Systemic Pharmacology A detailed study on pathophysiology of diseases, mechanism of action, pharmacology and toxicology of existing as well as novel drugs used in the following systems Autonomic Pharmacology Parasympathomimetics and lytics, sympathomimetics and lytics, agents affecting neuromuscular junction

UNIT-III
Central nervous system Pharmacology
General and local anesthetics Sedatives and hypnotics, drugs used to treat anxiety. Depression, psychosis, mania, epilepsy, neurodegenerative diseases. Narcotic and non-narcotic analgesics.

UNIT-IV
Cardiovascular Pharmacology
Diuretics, antihypertensives, antiischemics, anti- arrhythmics, drugs for heart failure and hyperlipidemia. Hematinics, coagulants , anticoagulants, fibrinolytics and antiplatelet drugs.

UNIT-V
Autacoid Pharmacology
The physiological and pathological role of Histamine, Serotonin, Kinins Prostaglandins Opioid autacoids. Pharmacology of antihistamines, 5HT antagonists

REFERENCES:

1. The Pharmacological Basis of Therapeutics, Goodman and Gillman's
2. Principles of Pharmacology. The Pathophysiologic basis of drug Therapyby David E Golan, Armen H, Tashjian Jr, EhrinJ, Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkins Publishers.
3. Basic and Clinical Pharmacology by B. G Katzung
4. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B. C. Yu.
6. Graham Smith. Oxford textbook of Clinical Pharmacology.
7. Avery Drug Treatment
8. Dipiro Pharmacology, Pathophysiological approach.
9. Green Pathophysiology for Pharmacists.

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I Year – I Sem M. Pharm. (Pharmacology)

CLINICAL PHARMACOLOGY & PHARMACOTHERAPEUTICS (Core Course II)

Course Objective

This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.

Course Outcome: At completion of this subject it is expected that students will be able to understand **–**

- the pathophysiology of selected disease states and the rationale for drug therapy;
- the controversies in drug therapy;
- the importance of preparation of individualised therapeutic plans based on diagnosis;
- needs to identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects);
- summarize the therapeutic approach to management of these diseases including reference to the latest available evidence;
- Therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).
- Pathophysiology and applied Pharmacotherapeutics of diseases associated with following system/diseases with of special reference to the drug of choice.

UNIT - I

Principles of Pharacokinetics

a. Revision of basic concepts.

b. Clinical Pharmacokinetics.

i) Dose – response in man
ii) Influence of renal and hepatic disease on Pharmacokinetics
iii) Therapeutics drug monitoring & individualization of drug therapy
iv) Population Pharmacokinetics.

UNIT - II

Adverse Drug Reactions, Drug Interactions, ADR monitoring & Pharmacovigilance.

UNIT - III

Pathophysiology and drug therapy of the following disorders.

Schizophrenia, anxiety, depression, epilepsy, Parkinson's, alzheimer's diseases, migraine, hypertension, angina pectoris, arrhythmias, atherosclerosis, myocardial infaraction.

UNIT - IV

Pathophysiology and drug therapy of the following disorders.

TB, leprosy, leukemia, solid tumors, lymphomas, psoriasis, respiratory, urinary, g.i. tract infections, endocarditis, fungal and HIV infection, rheumatoid arthritis, glaucoma, menstrual disorders, menopause.

UNIT - V

Drug therapy in

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a. Geriatrics
b. Pediatrics
c. Pregnancy & Lactation.
d. Renal & hepatic insufficiency

REFERENCES:

1. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication.
2. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange.
3. Pathologic basis of disease - Robins SL, W.B. Saunders publication.
4. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication.
5. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication.
6. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
7. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.
8. Relevant review articles from recent medical and pharmaceutical literature.
9. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange
10. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication
11. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem. M. Pharm. (Pharmacology)

PHARMACOKINETICS AND DRUG METABOLISM (Core course III)

Course Objective:
In current methods of treatment which involves individualization of drug therapy, the student should have sound knowledge in pharmacokinetics and the effects of changes in pharmacokinetic parameters on therapeutic efficacy of the drugs

Course Outcomes: Upon completion of the subject student shall be able to (Know, do, appreciate) –

- understand various pharmacokinetic parameters
- influence of these parameters on efficacy of drugs
- identify and resolve drug related problems;
- pharmacogenetics

UNIT - I
Drug Absorption: Gastrointestinal, percutaneous, and rectal kinetics and factors affecting drug absorption. Absorption kinetics

UNIT - II
Drug Distribution: Plasma protein binding – factors affecting plasma protein binding – Tissue binding – transfer of drugs through biological barriers their therapeutic implication in drug action. Volume of distribution. Reaction of the body to foreign substances: Biotransformation of drugs, phase I and phase II metabolic reactions.

UNIT - III
Elimination of drugs: Concept of renal clearance and excretion of drugs –biological half – life, area under curve.

UNIT - IV
Bioavailability of drug products: Bioavailability tests. Bioequivalence. Compartment models and relevant pharmacokinetic parameters.

UNIT - V
Pharmacogenetics: Inter racial and individual variability in drug metabolism.

REFERENCES:

1. Shargel and Leon. Applied Biopharmaceutics and pharmacokinetics. Latest edition. Publisher: Prentice Hall, London.
2. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi b. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvnia.
3. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.
4. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
5. Biopharmaceutics and Pharmacokinetics; By Robert F Notari f. Biopharmaceutics; By Swarbrick
6. Biopharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B. Jaiswal, Vallabh Prakashan Pitampura, Delhi
7. Cilincal Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and Thomas, N. Tozer, Lea and Febrger, Philadelphia 1995

8. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
9. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Robert F Notari Marcel Dekker Inn, New York and Basel, 1987.
10. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James, Roylan, Marcel Dekker Inc, New York 1996.

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I Year – I Sem M. Pharm. (Pharmacology)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (Core Elective - I)

Course Objective: The course is designed to impart the knowledge in the field of Pharmaceutical Analysis. The various modern analytical techniques like UV-Visible, IR, NMR, MS, GC, HPLC, different chromatographic methods and other important topics are taught to enable the students to understand and apply the principles involved in the determination of different bulk drugs and their formulation. In addition to the theoretical aspects, the basic practical knowledge relevant to the analysis is also imparted.

Course Outcome: The appreciable knowledge will be gained by the students in the Modern Analytical Techniques and can apply the theories in the Analysis of various bulk drugs and their formulations. The students will also be in a position to apply their knowledge in developing the new methods for the determination and validate the procedures

UNIT - I

Introduction to chromatography and classification of chromatographic methods based on the mechanism of separation

a. Column Chromatography: Adsorption and partition, theory, preparation, procedure and methods of detection
b. Thin Layer Chromatography: Theory, preparation, procedures, detection of compounds
c. Paper Chromatography: Theory, different techniques employed, filter papers used, qualitative and quantitative detection
d. Counter – current extraction, solid phase extraction techniques, gel filtration

UNIT - II

a. Gas chromatography: Introduction, fundamentals, instrumentation, columns: preparation and operation, detection, dramatization.
b. **HPLC**: Principles and instrumentation, solvents and columns used, detection and applications
c. **HPTLC**: Theory and principle, instrumentation, elution techniques and pharmaceutical applications

UNIT - III

a. UV-Visible spectroscopy: Introduction, electromagnetic spectrum, absorbance laws and limitations, instrumentation-design and working principle, chromophore concept, auxochromes, Wood-Fisher rules for calculating absorption maximum, applications of UV-Visible spectroscopy
b. IR spectroscopy: Basic principles-Molecular vibrations, vibrational frequency, factors influencing vibrational frequencies, sampling techniques, instrumentation, interpretation of spectra, FT-IR, theory and applications

UNIT - IV

Mass spectroscopy: Theory, ionization techniques: electron impact ionization, chemical ionization, field ionization, fast atom bombardment, plasma desorption, fragmentation process: types of fission, resolution, GC/MS, interpretation of spectra and applications for identification and structure determination

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UNIT - V

NMR: Theory, instrumentation, chemical shift, shielding and deshielding effects, splitting of signals, spin-spin coupling, proton exchange reactions, coupling constant(J), nuclear overhauser effect(NOE), ^{13}CNMR spectra and its applications, 2D-NMR, COSY and applications in pharmacy

REFERENCES:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. A Text book of Pharmaceutical Analysis by Kerrenth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein
11. HPTLC by P.D. Seth
12. Indian Pharmacopoeia 2007
13. High Performance thin layer chromatography for the analysis of medicinal plants by Eike Reich, Anne Schibli
14. Introduction to instrumental analysis by Robert. D. Braun

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem. M. Pharm. (Pharmacology)

CLINICAL RESEARCH AND PHARMACOVIGILANCE (Core Elective - I)

Course Objective: This subject will provide a value addition and current requirement for the students in clinical research and pharmacovigilance. It will teach the students on conceptualizing, designing, conducting, managing and reporting of clinical trials. This subject also focuses on global scenario of pharmacovigilance in different methods that can be used to generate safety data. It will teach the students in developing drug safety data in pre-clinical, clinical phases of drug development and post market surveillance.

Course Outcomes: Upon completion of the course, the student shall be able to,

- Explain the regulatory requirements for conducting clinical trial
- Demonstrate the types of clinical trial designs
- Explain the responsibilities of key players involved in clinical trials
- Execute safety monitoring, reporting and close-out activities
- Explain the principles of Pharmacovigilance
- Detect new adverse drug reactions and their assessment
- Perform the adverse drug reaction reporting systems and communication in pharmacovigilance

UNIT- I

Regulatory Perspectives of Clinical Trials: Origin and Principles of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines Ethical Committee: Institutional Review Board, Ethical Guidelines for Biomedical Research and Human Participant-Schedule Y, ICMR, Informed Consent Process: Structure and content of an Informed Consent Process Ethical principles governing informed consent process

UNIT - II

Clinical Trials: Types and Design: Experimental Study- RCT and Non RCT, Observation Study: Cohort, Case Control, Cross sectional Clinical Trial Study Team Roles and responsibilities of Clinical Trial Personnel: Investigator, Study Coordinator, Sponsor, Contract Research Organization and its management.

UNIT- III

Clinical Trial Documentation: Guidelines to the preparation of documents, Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study Report Clinical Trial Monitoring-Safety Monitoring in CT Adverse Drug Reactions: Definition and types. Detection and reporting methods. Severity and seriousness assessment. predictability and preventability assessment. Management of adverse drug reactions; Terminologies of ADR.

UNIT- IV

Basic aspects, terminologies and establishment of pharmacovigilance: History and progress of pharmacovigilance, Significance of safety monitoring, Pharmacovigilance in India and international aspects, WHO international drug monitoring programme, WHO and Regulatory terminologies of ADR, evaluation of medication safety, Establishing pharmacovigilance centres in Hospitals, Industry and National programmes related to pharmacovigilance. Roles and responsibilities in Pharmacovigilance.

UNIT- V

Methods, ADR reporting and tools used in pharmacovigilance: International classification of diseases, International Nonproprietary names for drugs, Passive and Active surveillance, Comparative observational studies, targeted clinical investigations and Vaccine safety surveillance. Spontaneous reporting system and Reporting to regulatory authorities, Guidelines for ADRs reporting. Argus, Aris G Pharmacovigilance, Vigi Flow, Statistical methods for evaluating medication safety data.

REFERENCES:

1. Central Drugs Standard Control Organization- Good Clinical Practices, Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
2. International Conference on Harmonization of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonized Tripartite Guideline. Guideline for Good Clinical Practice. E6; May 1996.230
3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
5. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
6. Handbook of clinical Research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone.
7. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
8. Textbook of Pharmacovigilance: Concept and Practice. G. P. Mohanta and P. K. Manna. 2016, Pharma Med Press.
9. A textbook of Clinical Pharmacy Practice: Essential Concepts and Skills. Second Edition, 2012, University Press

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmacology)

PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS (Open Elective - I)

Course Objective:
This course enables students to understand various pharmacoepidemiological methods and their clinical applications. Also, it aims to impart knowledge on basic concepts, assumptions, terminology, and methods associated with Pharmacoeconomics and health related outcomes, and when should be appropriate Pharmacoeconomic model should be applied for a health care regimen.

Course Outcome: Upon completion of this course it is expected that students shall be able to:

- Understand the various epidemiological methods and their applications
- Understand the fundamental principles of Pharmacoeconomics.
- Identify and determine relevant cost and consequences associated with pharmacy products and services.
- Perform the key Pharmacoeconomics analysis methods
- Understand the Pharmacoeconomic decision analysis methods and its applications.
- Describe current Pharmacoeconomic methods and issues.
- Understand the applications of Pharmacoeconomics to various pharmacy settings.

UNIT- I
Introduction to Pharmacoepidemiology:
Definition, Scope, Need, Aims & Applications; Outcome measurement: Outcome measures, Drug use measures: Monetary units, Number of prescriptions, units of drug dispensed, defined daily doses, prescribed daily doses, Diagnosis and Therapy surveys, Prevalence, Incidence rate, Monetary units, number of prescriptions, unit of drugs dispensed, defined daily doses and prescribed daily doses, medications adherence measurements. Concept of risk: Measurement of risk, Attributable risk and relative risk, Time- risk relationship and odds ratio

UNIT- II
Pharmacoepidemiological Methods:
Qualitative models: Drug Utilization Review; Quantitative models: case reports, case series, Cross sectional studies, Cohort and case control studies, Calculation of Odds' ratio, Meta analysis models, Drug effects study in populations: Spontaneous reporting, Prescription event monitoring, Post marketing surveillance, Record linkage systems, Applications of Pharmacoepidemiology

UNIT- III
Introduction to Pharmacoeconomics:
Definition, history of Pharmacoeconomics, Need of Pharmacoeconomic studies in Indian healthcare system. Cost categorization and resources for cost estimation: Direct costs. Indirect costs. Intangible costs. Outcomes and Measurements of Pharmacoeconomics: Types of outcomes: Clinical outcome, Economic outcomes, Humanistic outcomes; Quality Adjusted Life Years, Disability Adjusted Life Years Incremental Cost Effective Ratio, Average Cost Effective Ratio. Person Time, Willingness To Pay, Time Trade Off and Discounting.

UNIT- IV
Pharmacoeconomic evaluations:
Definition, Steps involved, Applications, Advantages and disadvantages of the following Pharmacoeconomic models: Cost Minimization Analysis (CMA), Cost Benefit Analysis (CBA), Cost

Effective Analysis (CEA), Cost Utility Analysis (CUA), Cost of Illness (COI), Cost Consequences Analysis (COA).

UNIT - V

Definition, Steps involved, Applications, Advantages and disadvantages of the following:

Health related quality of life (HRQOL): Definition, Need for measurement of HRQOL, Common HRQOL measures. Definition, Steps involved, Applications of the following: Decision Analysis and Decision tree, Sensitivity analysis, Markov Modeling, Software used in pharmacoeconomic analysis, Applications of pharmacoeconomics.

REFERENCES:

1. Rascati K L. Essentials of Pharmacoeconomics, Woulters Kluwer Lippincott Williams & Wilkins, Philadelphia.
2. Thomas E Getzen. Health economics. Fundamentals and Flow of Funds. John Wiley & Sons, USA.
3. Andrew Briggs, Karl Claxton, Mark Sculpher. Decision Modelling for Health Economic Evaluation, Oxford University Press, London.
4. K G Revikumar, Pharmacoepidemiology and Pharmacoeconomics Concepts and Practices.
5. Michael Drummond, Mark Sculpher, George Torrence, Bernie O'Brien and Greg Stoddart. Methods for the Economic Evaluation of Health Care Programmes Oxford University Press, London.
6. George E Mackinnon III. Understanding health outcomes and pharmacoeconomics.
7. Graker, Dennis. Pharmacoeconomics and outcomes.
8. Walley, Pharmacoeconomics.
9. Pharmacoeconomic – ed. by Nowakowska – University of Medical Sciences, Poznan.
10. Relevant review articles from recent medical and pharmaceutical literature
11. Guru Prasad Mohanta and P K Manna, Textbook of Pharmacovigilance Concepts and Practice

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmacology)

DRUG REGULATORY AFFAIRS (Open Elective – I)

Course Objective: The topics which are present in the Drug regulatory affairs are very much useful which increases the knowledge regarding the regulatory aspects in the pharmaceutical industries.

Course Outcomes:

- Students will come to know the different competent regulatory authorities globally.
- Students be aware of technical aspects pertaining to the marketing authoritization application (MAA)
- The regulatory guidelines and directions framed by the regulatory authorities will be helpful to place the drug products in market for marketing approvals.

UNIT - I

A study of regulatory aspects that affect drug product design, manufacture and distribution in India with special emphasis on the detailed study of the following Acts (with latest amendments)

UNIT - II

The Drugs and Cosmetics Act, 1940 and Rules there under. Recent amendments to Drugs and Cosmetic Act and other relevant rules.
Drugs (Price Control) Order in force. Loan license (contract manufacture). Certification and licensing procedures.

UNIT - III

A detailed study of regulatory aspects that affect drug product design, manufacture and distribution in a developed country such as USA and in a developing country such as Brazil, Hatch Waxmann Act;
Bolar Provisions and other FDA Regulations. Regulatory aspects of pharmaceutical and bulk drug manufacture, regulatory drug analysis.

UNIT - IV

Documentation related to manufacturing, cleaning methods, retention samples and records, quality control, batch release documents, distribution records, complaints and recalls.
Quality, safety and legislation for cosmetic products and herbal products.

UNIT - V

Governing Regulatory Bodies across the globe.

Country Authority Submission

a. U.S Food & Drug Administration USDMF
b. Canada Therapeutic Product Directorate DMF
c. Europe
    1) European Medicines Agency (EMEA/ National Authorities) EDMF
    2) European Directorate for Quality of Medicines CEP/COS & Health Care Products
d. Product Filing
e. Responding Regulatory Deficiencies
f. Final Approval Procedure

Preparation, review, and submission of Drug Master Files to Regulatory Authorities as per their specific requirements.

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TEXT AND REFERENCE BOOKS:

1. Original laws published by Govt. of India.
2. Text Book of Forensic Pharmacy by Mithal B. M.; Vallabh Prakashan, New Delhi.
3. Laws of Drugs in India by Hussain.
4. Text Book of Forensic Pharmacy by Jain N. K.; Vallabh Prakashan, New Delhi.
5. Pharmaceutical Regulatory Affairs - Selected Topics, CVS Subramanyam and J Thimmasetty, Vallabha Prakashan Delhi - 2013

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem. M. Pharm. (Pharmacology)

HERBAL COSMETICS TECHNOLOGY (Open Elective - I)

Course Objective:
The topics helps the students to get exposed to processes involved in the manufacturing of herbal cosmetics including the skin and hair care herbal products preparation and their evaluation

Course Outcome:
Students will learn about the raw materials used in herbal cosmetics and get exposed to various preparations herbal cosmetics.

UNIT - I

a) Introduction, historical background and present status of Herbal cosmetics
b) Processes used in the manufacture of cosmetics-Emulsification, Mixing, compaction, Moulding, Packing. Raw materials used in preparation of herbal cosmetics
c) Machinery and Equipment for Cosmetics: Cream, Liquid, Powder and emulsion making machinery
d) Quality, safety and efficacy of Herbal cosmetics

UNIT - II

Skin care Products: Method of preparation, pharmaceutical and Pharmacological evaluation procedures for various formulations like Creams, Lotions, Lipsticks, face packs. Elaborative study of five formulations under each category with regard to their composition and claims for various herbs used in them.

UNIT - III

Hair care Products: Method of preparation, pharmaceutical and Pharmacological evaluation procedures for various formulations like hair dyes, creams, Lotions, Jels, oils and Shampoos. Elaborative study of five formulations under each category with regard to their composition and claims for various herbs used in them.

UNIT - IV

A brief account of following herbals or herb extracts or herbal products of cosmetic importance such as *Acacia concinna* pods, Aloe Vera, Almond oil, Neem, *Citrus aurantium* peels, Henna, Turmeric, Liquorice, Olive oil, tea tree oil and wheat germ oil with special emphasis on their source, active principles and cosmetic properties.

UNIT - V

a) General Principles of Quality control and standardization of cosmetics-Raw material control, Packaging material control, finished product control, Shelf testing.
b) Natural colorants : Biological Source, coloring principles, chemical nature and usage of the following Annato, Cochineal, Caramel, Henna, Indigo, Madder, Saffron , Turmeric
c) Flavors and Perfumes : Sandal wood oil, Orange oil, Lemon oil, Vanilla, Palmarosa, geranium oil

REFERENCES:

1. Cosmetics- Formulation, Manufacturing and Quality control –P.P. Sharma
2. Herbal Cosmetics Hand Book- H. Panda
3. Herbal Cosmetics by P. K Chattopadhyay
4. The Complete Technology Book on Herbal Perfumes and Cosmetics by H. Panda

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem. M. Pharm. (Pharmacology)

PHARMACEUTICAL MANAGEMENT (Open Elective - I)

Course Objective: The topics which are present in the pharmaceutical management are very much useful to the students in personality development become a perfect pharma professional.

Course Outcomes:

- These topics are useful for the students to know how to manage a pharma industry and its various departments viz QA, QC, RA, Production etc.
- Along with this it aids the students to develop leadership qualities, communication &interpersonal skills, decisions making, motivation, organization &various managerial functions & professional skills required for a dynamic professional.
- Management helps to understand the concept of managerial control, its levels &role, importance in pharma industry

UNIT - I

Pharmaceutical Management: Meaning, Evolution-scientific, administrative and human relation approach. Process of management: Planning, organizing, staffing, directing, coordinating and controlling–a preliminary idea of concepts, processes and techniques.

UNIT - II

Fundamental concepts of production, financial, personal, legal and marketing functions with special reference to Pharmaceutical Management. Introduction to budgeting, costing, accounting, auditing, and budgetary control. Entrepreneurship development.

UNIT - III

Understanding organizations: Meaning, process, types of organization structures and departmentation, line/staff authority, promoting organizational culture. Organizations, pharmaceutical services and functioning of hospital pharmacy, bulk drug unit, formulation unit, Ayurvedic and Unani manufacturing units and testing labs etc.

UNIT - IV

Professional Mangers; Tasks, responsibilities and skills needed. Leadership; Styles and managing change. Decision Making; Types, procedures, evaluation and selection of alternatives, decision making under various situations. Management information and decision support systems and time management.

Personnel Management: Job Analysis, recruitment, selection, orientation and training, performance appraisal and compensation. Retrenchment, lay off and discharge.

UNIT - V

Management of Industrial Relations: Industrial disputes, settlement of disputes through various routes such as bargaining, etc.

Motivational aspects, theories of motivation, group dynamics, rewards and incentives, interpersonal skills, significance of communication, its processes, measures for effective communication, conflict management. Stress management.

TEXT AND REFERENCE BOOKS

1. Marketing Management by Philip Kotlar; Prentice-Hall of India Ltd., New Delhi.
2. Management and Organization by Louis A. Allen; McGraw Hill, Tokyo.

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Princeton College of Pharmacy,
Kommula Vill, Vijayapuri Colony,
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3. Corporate Strategy by Ansoff, H.T.; McGraw Hill, New York.
4. Modern Management by Hempran David R.; McGraw Hill, New York.
5. Management by Stoner and Freeman; Prentice Hall, New Delhi.
6. Motivation and Personality by Maslow, Abraham, Harper & Row, New York.
7. Management of Organizational Behavior, Utilizing the Human Resources by Harcey, Paul and Blanchard Kenneth; Prentice Hall of India, New Delhi.
8. Organization Structure, Process and out comes V th Edition Richard. H. Hall
9. Principles and Methods of Pharmacy Management III rd Edition Harry A. Smith.
10. Management "Global Perspective Heinz Weihrich, Harold Koontz by Tata Mcgraw Hill".
11. Personnel Management and Industrial Relations by P. C. Tripathi.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem. M. Pharm. (Pharmacology)

PHARMACEUTICAL FORMULATION TECHNOLOGY (Open Elective –I)

Course Objectives: Students will know the preformulation studies, methodology, different excipients used in solid dosage forms and their evaluation with references to production technologies. The students also know the optimization techniques and their applications in pharmaceutical industries.

Course Outcome: Students shall explain the preformulation parameters, apply ICH guidelines and evaluate drug, drug excipients compatibility. Students also explain about formulation and development, use of excipients in tablets, powders, capsules, micro-encapsules and coating techniques. They also learn and apply the statistical design in different formulations.

Unit - I:

Preformulation: Goals of preformulation, solid state manipulation and characterization. pH dependent solubility of drug, equilibrium solubility, intrinsic dissolution of drug, particle size distribution.

Flow of Powders: Physical properties and importance. Angle of repose, Cars index, compressibility, bulk density, tapped density.

Unit - II:

Excipients used in various dosage forms like tablets, capsules, emulsions, suspensions, semisolids and sterile products. Knowledge of packing materials. Drug- excipient compatibility- Drug stability, factors affecting stability, stabilization methods.

Unit - III:

Tablets: Types of tablets, granulation methods, highlighting operations such as mixing, drying, milling, blending, lubrication and compression.

Tablet coating: Types of coating, steps involved in coating process- pan coating and fluid bed coating and problems associated with coating.

Hard Gelatin Capsules: General principles and steps involved in the production of drug loaded hard gelatin capsules, filling operation, filling of powders, granules and pellets.

Unit - IV:

Dissolution: Principles of dissolution, factors influencing dissolution, official methods and apparatus. Dissolution of immediate release, controlled release and delayed release products.

Unit - V:

Stability testing: Chemical degradation and preventive measures. Various stability testing conditions and use of stabilizers in packing

TEXT BOOKS:

1. Pharmaceutics - The Science of Dosage form design by ME Aulton.
2. Pharmaceutical Dosage forms - Tablets (Vol I, II and III) by Lieberman, Lachman and Schwartz.
3. Pharmaceutical Dosage forms - Capsules (Vol I, II and III) by Avis, Lieberman and Lachman.
4. Pharmaceutical Dosage forms – Disperse systems (Vol I, II and III) by Avis, Lieberman and Lachman.
5. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.
6. Pharmaceutical statistics by Bolton

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7. Industrial Pharmacy - Selected Topics , CVS Subramanyam and J Thimmasetty, Vallabha Prakashan Delhi - 2013

REFERENCE BOOKS:

1. The Theory and Practice of industrial Pharmacy by Leon Lachman, Herbert A. Lieberman.
2. Remington's Science and Practice of Pharmacy by A. Gennaro.
3. Ansel's Pharmaceutical Dosage form and Drug delivery system by Loyd V. Allen, Jr. Nicholas G. Popovich, Howard C. Ansel.
4. Generic Drug Product Development by Leon Shargel and Isadore Kanfer.
5. Dispensing for Pharmaceutical Students by SJ Carter.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmacology)

ADVANCED PHARMACOLOGY - I LAB

List of experiments

Handling of laboratory animals.

1. Various routes of drug administration.
2. Study of techniques of blood sampling, anesthesia and euthanasia of experimental animals.
3. To record the dose response curve of Ach using isolated ileum/rectus abdominis muscle preparation.
4. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by interpolation method.
5. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by three point method.
6. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by four point method.
7. Estimation of pA2 value on isolated tissues
8. Bioassay of 5-HT using rat fundus strip
9. Bioassay of oxytocin using rat uterus

REFERENCES:

1. CPCSEA, OECD, ICH, USFDA, Schedule Y, EPA guidelines,
2. Fundamentals of experimental Pharmacology by M. N. Ghosh
3. Handbook of Experimental Pharmacology by S.K. Kulkarni.
4. Drug discovery and Evaluation by Vogel H.G.
5. Practical Manual of Experimental and Clinical Pharmacology by Bikash Medhi (Author), Ajay Prakash (Author) Jaypee brothers' medical publishers Pvt. Ltd

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmacology)

CLINICAL PHARMACOLOGY AND PHARMACOTHERAPEUTICS LAB

The students are required to be collect Prescriptions and of clinical details of different patients for their exposure with therapeutic management and other clinical aspects. They are expected to have experience and do a case presentation in the following clinical conditions. The students have to make at least 5 case presentations covering most common diseases. The student should also submit a record of the cases presented. The list of clinical cases presented should include follow-up of the clinical cases mentioned below from the day of admission till discharge and presented in the SOAP (Subjective, Objective, Assessment and Plan) format.

I. The cases may be selected from the following diseases:

1. Neurology& Psychiatry
2. Oncology
3. Infectious Diseases & Immunology
4. Gynecologic & Obstetric Disorders/ Ophthalmology
5. Cardiology
6. Dermatology
7. Endocrinology

II. Rational use of medicines in special population (three)
III. Calculation of Bioavailability and Bioequivalence from the given data (two)
IV. Interpretation of Therapeutic Drug Monitoring reports of a given patient (three)
V. Calculation of various Pharmacoeconomic outcome analysis for the given data (two)

Assignments

The students are required to submit a minimum of three written assignments (1500 to 2000 words) selected from the topics on different disease conditions given to them. The students are required to discuss both the clinical and therapeutic aspects in the same.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Pharmacy (PHARMACEUTICS / PHARMACEUTICAL TECHNOLOGY)

COURSE STRUCTURE AND SYLLABUS
Effective from Academic Year 2017-18 Admitted Batch

I Year – I Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course I	Advanced Physical Pharmaceutics	25	75	4	--	4
Core Course II	Modern Pharmaceutics-I	25	75	4	--	4
Core Course III	Applied Biopharmaceutics and Pharmacokinetics	25	75	4	--	4
Core Elective I	1. Modern Pharmaceutical Analytical Techniques 2. Intellectual Property Rights	25	75	4	--	4
Open Elective I	1. Pharmacoepidemiology and Pharmacoeconomics 2. Drug Regulatory Affairs 3. Herbal Cosmetics Technology 4. Pharmaceutical Validation 5. Pharmaceutical Management	25	75	4	--	4
Laboratory I	Advanced physical Pharmaceutics Lab	25	75	---	6	3
Laboratory II	Applied Biopharmaceutics and Pharmacokinetics Lab	25	75	--	6	3
Seminar I	Seminar	100	--	--	4	2
Total Credits		**275**	**525**	**20**	**16**	**28**

I Year – II Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course IV	Advanced Drug Delivery Systems	25	75	4	--	4
Core Course V	Industrial Pharmacy	25	75	4	--	4
Core Course VI	Modern Pharmaceutics-II	25	75	4	--	4
Core Elective II	1. Biostatistics And Research Methodology 2. Stability of Drugs and Dosage Forms	25	75	4	--	4
Open Elective II	1. Screening Methods in Pharmacology 2. Nano Based Drug Delivery Systems 3. Nutraceuticals 4. Entrepreneurship management 5. Clinical Research And Pharmacovigilance	25	75	4	--	4
Laboratory III	Advanced Drug Delivery Systems Lab	25	75	---	6	3
Laboratory IV	Modern Pharmaceutics Lab	25	75	--	6	3
Seminar II	Seminar	100	--	--	4	2
Total Credits		**275**	**525**	**20**	**16**	**28**

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II Year - I Semester

Course Title	Int. marks	Ext. marks	L	P	C
Comprehensive Viva-Voce	--	100	--	--	4
Project work Review II	100	--	--	24	12
Total Credits	**100**	**100**	--	24	**16**

II Year - II Semester

Course Title	Int. marks	Ext. marks	L	P	C
Project work Review III	100	--	--	8	4
Project Evaluation (Viva-Voce)	--	100	--	16	12
Total Credits	**100**	**100**	**--**	**24**	**16**

$ For Project review I, please refer 7.9 in R17 Academic Regulations

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm (Pharmaceutics/Pharmaceutical Technology)

ADVANCED PHYSICAL PHARMACEUTICS (Core course - I)

Course Objective: The students shall apply the principles of physical and chemical properties of particle science, polymer science and their use in pharmaceutical dosage forms. They also learn the compression and consolidation parameters for powders and granules. Students also learn about the rheology, disperse systems, dissolution and solubility related parameters for dosage forms.

Course Outcome: The students will learn particle size analysis method, solid dispersion, physics of tablets, polymer classification and its applications, student will also practice the stability calculations, shelf life calculations and accelerated stability studies. They also understand the rheology, absorption related to liquids and semi-solid dosage forms with advances. They also know the factors affecting the dissolution and solubility in related to invitro/invivo correlations.

UNIT - I

Polymer science: Classification, properties and characterization of polymers, phase separation, polymers in solid state, preparation of polymer solution, application of polymers in pharmaceutical formulations. Mechanism of biodegradation of biodegradable polymers including controlled drug delivery systems, Mucoadhesive, Hydrodynamically balanced and Transdermal Systems.

UNIT - II

Physics of tablet compression: Basic principles of interactions, compression and consolidation, compression and consolidation under high loads, effect of friction, distribution of forces in compaction, force volume relationships, Heckel plots, compaction profiles, energy involved in compaction, Measurement of compression with strain gauges, compression pressure-QA parameters.

UNIT - III

Kinetics and drug stability: Stability calculations, rate equations, complex order kinetics, Factors influencing stability, strategy of stability testing, method of stabilization, method of accelerated stability testing in dosage forms, temperature and humidity control, physical stability testing of pharmaceutical products. Photodecomposition and solid state decomposition.

UNIT - IV

Viscoelasticity: Theoretical consideration, instrumentation, rheological properties of disperse systems and semisolids. Oscillatory testing, Creep measurement.

Characterization of API and excipients:

Differential Scanning Calorimetry: Principle, thermal transitions, advantages, disadvantages, instrumentation, applications, and interpretations

X Ray Diffraction methods: Origin of x-rays, applications, advantages, disadvantages, instrumentation, applications, and interpretations..

UNIT - V

Dissolution and solubility: Solubility and solubilization of nonelectrolytes, solubilization by the use of surfactants, cosolvents, complexation, drug derivatisation and solid state manipulation, Mechanisms of Drug release - dissolution, diffusion (Matrix and Reservoir) and swelling controlled (Peppas Model) and dissolution equipment.

TEXT BOOKS:

1. Physical Pharmacy, 4th Edition by Alfred Martin.

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2. Theory and Practice of Tablets – Lachman Vol.4
3. Pharmaceutical Dosage forms – Disperse systems Vol. I & II
4. Cartenson “Drug Stability, Marcel Decker Solid state properties, Marcel Dekker.
5. Industrial Pharmacy - Selected Topics, CVS Subramanyam and J Thimmasetty, Vallabha Prakashan Delhi - 2013

REFERENCE BOOKS:

1. Dispersive systems I, II, and III
2. Robinson. Controlled Drug Delivery Systems

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmaceutics/Pharmaceutical Technology)

MODERN PHARMACEUTICS – I (Core course II)

Course Objectives: Students will know the preformulation studies, methodology, different excipients used in solid dosage forms and their evaluation with references to production technologies. The students also know the optimization techniques and their applications in pharmaceutical industries.

Course Outcome: Students shall explain the preformulation parameters, apply ICH guidelines, and evaluate drug, drug excipients compatibility. Students also explain about formulation and development, use of excipients in tablets, powders, capsules, micro-encapsules and coating techniques. They also learn and apply the statistical design in different formulations.

UNIT - I

Preformulation studies: Goals of Preformulation, preformulation parameters, Polymorphs and Amorphous forms, selection of drugs- solubility, partition coefficient, salt forms, humidity, solid state properties, Particle Size Analysis (Laser Diffraction and Dynamic Light Scattering) drug-excipient compatibility, flow properties, format and content of reports of preformulation, preformulation stability studies (ICH**)**

UNIT - II

Formulation development of solid dosage forms – I: New materials, excipients science - diluents, disintegrants, super disintegrants, etc, evaluation of functional properties of excipients, co-processed materials, methods of preparation and evaluation.

UNIT - III

Formulation development of solid dosage forms– II: Coating, coating machines, coating techniques in tablet technology for product development, computerization, inprocess control of tablets, formulation development and manufacture of powder dosage forms for internal use.
Microencapsulation- types, methodology, problems encountered.

UNIT - IV

Formulation development of soft and hard gelatin capsules: Introduction, production and methods of manufacture, filling equipment, and filling operations, formulations, finishing, special techniques, advances in capsule manufacture, machines, processing, and control including pharmaceutical aspects, physical stability, and packaging.

UNIT - V

Optimization techniques in pharmaceutical formulation and processing: Introduction, optimization parameters, statistical design, response surface method, contour diagrams, factorial design, partial factorial design, simplex methods, mixture designs, Placket Burhan method, Box Benken method, applications in pharmaceutical formulation.

TEXT BOOKS

1. Pharmaceutics - The Science of Dosage form design by ME Aulton.
2. Pharmaceutical Dosage forms - Tablets (Vol I, II and III) by Lieberman, Lachman and Schwartz.
3. Pharmaceutical Dosage forms - Capsules (Vol I, II and III) by Avis, Lieberman and Lachman.
4. Pharmaceutical Dosage forms – Disperse systems (Vol I, II and III) by Avis, Lieberman and Lachman.

5. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.
6. Pharmaceutical statistics by Bolton

RECOMMENDED BOOKS:

1. The Theory and Practice of industrial Pharmacy by Leon Lachman, Herbert A. Lieberman.
2. Remington's Science and Practice of Pharmacy by A. Gennaro.
3. Ansel's Pharmaceutical Dosage form and Drug delivery system by Loyd V. Allen, Jr. Nicholas G. Popovich, Howard C. Ansel.
4. Generic Drug Product Development by Leon Shargel and Isadore Kanfer.
5. Dispensing for Pharmaceutical Students by SJ Carter.
6. Industrial Pharmacy - Selected Topics , CVS Subramanyam and J Thimmasetty, Vallabha Prakashan Delhi - 2013

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmaceutics/Pharmaceutical Technology)

APPLIED BIOPHARMACEUTICS AND PHARMACOKINETICS (Core course - III)

Course Objective: The student shall learn about bioavailability, bioequivalence and factor affecting bioavailability. They also learn the pharmacokinetic parameter like drug disposition, absorption, non-linear and time dependant pharmacokinetics. They also understand about the drug interactions & problems, practice associated in pharmacokinetic parameters calculations.

Course Outcome: students will be able to express factors affecting the bioavailability and stability of dosage form; they also learn the bioequivalence studies and protocols for bioequivalent studies. They also evaluate the parameters for the disposition, absorption and Michaelis-Menton constants for non-linear kinetics.

UNIT - I

1. Biological and metabolic factors affecting bioavailability, complexation, dissolution - techniques of enhancing dissolution.
2. Formulation factors affecting bioavailability of drugs in dosage forms of tablets, capsules, parenterals, liquid orals and topical dosage forms.
3. **Bioavailability:** Importance, dose dependency, AUC, rate and extent, assessment, blood and urine samples, single dose and multiple dose studies, Invitro Invivo Correlation analysis and Levels of Correlations.
4. **Bioequivalence:** Importance equivalency concepts, biowaivers, study designs, protocol, transformation of data, Statistical Criteria as per the Regulations.

UNIT - II

Pharmacokinetics – Drug Disposition: compartment models: One, two and non-compartmental approaches to pharmacokinetics. Recent trends, merits and limitations of these approaches. Application of these models to determine the various pharmacokinetic parameters pertaining to:

a. Distribution: Apparent volume of distribution and its determination. factors affecting.
b. Metabolism: Metabolic rate constant, Factors affecting Metabolism
c. Elimination: Over all apparent elimination rate constant, and half life.

   All the above under the following conditions:

   1. Intravenous infusion
   2. Multiple dose injections

d. Noninvasive methods of estimating pharmacokinetics parameters with emphasis on salivary and urinary samples.
e. Concept of clearance: organ, total clearance, hepatic clearance, lung clearance and renal clearance.

UNIT - III

Pharmacokinetics – Absorption: Rate constants **–** Zero order, first order, Models of experimental study of absorption (in silico, in vitro, in situ and in vivo) – Absorption half lives, method of residuals, Wagner – Nelson method, Loo - Reigleman method, Analysis of kinetics from urine samples. Pharmacokinetic parameters determination pertaining to: Multiple dosage oral administration

UNIT - IV

Non-linear pharmacokinetics: Concepts of linear and non-linear pharmacokinetics, Michaelis-Menton kinetics characteristics. Basic kinetic parameters, possible causes of non-induction, non-linear binding, and non-linearity of pharmacological responses.

Clinical Pharmacokinetics: Altered kinetics in pregnancy, child birth, infants and geriatrics. kinetics in GI disease, malabsorption syndrome, liver, cardiac, renal and pulmonary disease states.

UNIT - V

Time dependent pharmacokinetics: Introduction, classification, physiologically induced time dependency: Chronopharmacokinetics - principles, drugs– (amino glycosides, NSAIDS, antihypertensive drug) chemically induced dependency.

Drug Interactions: Kinetics of drug interaction, study of drug-drug interaction mediated through absorption, distribution, metabolism and elimination, mechanisms of interaction and consequence.

- ❖ Numerical problems associated with all units, if any.

TEXT BOOKS:

1. Biopharmaceutics and Clinical Pharmacokinetics by MiloGibaldi.
2. Learn Shargel and ABC yu, Applied Biopharmacokinetics and
3. Biopharmaceutics and Pharmacokinetics by C.V.S. Subrahmanyam, Vallabh Prakashan. 2010.
4. Basic biopharmaceutics, Sulnil S. Jambhekar and Philip J Brean.
5. Text book of Biopharmaceutics and Clinical Pharmacokinetics by Niazi Sarfaraz

RECOMMENDED BOOKS:

1. Bio-Pharmaceutics and Pharmacokinetics by V. Venkateshwarlu.
2. Pharmacokinetics. Biopharmaceutics and Clinical pharmacy by Robert E. Notari.
3. Biopharmaceutics and Clinical Pharmacokinetics - An Introduction by Robert E. Notari.
4. Drug drug interactions, scientific and regulatory perspectives by Alber P. G

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmaceutics/Pharmaceutical Technology)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (Core Elective - I)

Course Objective: The course is designed to impart the knowledge in the field of Pharmaceutical Analysis. The various modern analytical techniques like UV-Visible, IR, NMR, MS, GC, HPLC, different chromatographic methods and other important topics are taught to enable the students to understand and apply the principles involved in the determination of different bulk drugs and their formulation. In addition to the theoretical aspects, the basic practical knowledge relevant to the analysis is also imparted.

Course Outcome: The appreciable knowledge will be gained by the students in the Modern Analytical Techniques and can apply the theories in the Analysis of various bulk drugs and their formulations. The students will also be in a position to apply their knowledge in developing the new methods for the determination and validate the procedures

UNIT - I

Introduction to chromatography and classification of chromatographic methods based on the mechanism of separation

a. Column Chromatography: Adsorption and partition, theory, preparation, procedure and methods of detection
b. Thin Layer Chromatography: Theory, preparation, procedures, detection of compounds
c. Paper Chromatography: Theory, different techniques employed, filter papers used, qualitative and quantitative detection
d. Counter – current extraction, solid phase extraction techniques, gel filtration

UNIT - II

a. Gas chromatography: Introduction, fundamentals, instrumentation, columns: preparation and operation, detection, dramatization.
b. **HPLC**: Principles and instrumentation, solvents and columns used, detection and applications
c. **HPTLC**: Theory and principle, instrumentation, elution techniques and pharmaceutical applications

UNIT - III

a. UV-Visible spectroscopy: Introduction, electromagnetic spectrum, absorbance laws and limitations, instrumentation-design and working principle, chromophore concept, auxochromes, Wood-Fisher rules for calculating absorption maximum, applications of UV-Visible spectroscopy
b. IR spectroscopy: Basic principles-Molecular vibrations, vibrational frequency, factors influencing vibrational frequencies, sampling techniques, instrumentation, interpretation of spectra, FT-IR, theory and applications

UNIT - IV

Mass spectroscopy: Theory, ionization techniques: electron impact ionization, chemical ionization, field ionization, fast atom bombardment, plasma desorption, fragmentation process: types of fission, resolution, GC/MS, interpretation of spectra and applications for identification and structure determination

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UNIT - V

NMR: Theory, instrumentation, chemical shift, shielding and deshielding effects, splitting of signals, spin-spin coupling, proton exchange reactions, coupling constant(J), nuclear overhauser effect(NOE), ^{13}CNMR spectra and its applications, 2D-NMR, COSY and applications in pharmacy

REFERENCES:

1. Instrumental Methods of Chemical Analysis by B. K Sharma
2. Organic spectroscopy by Y.R Sharma
3. A Text book of Pharmaceutical Analysis by Kerrenth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein
11. HPTLC by P.D. Seth
12. Indian Pharmacopoeia 2007
13. High Performance thin layer chromatography for the analysis of medicinal plants by Eike Reich, Anne Schibli
14. Introduction to instrumental analysis by Robert. D. Braun

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmaceutics/Pharmaceutical Technology)

INTELLECTUAL PROPERTY RIGHTS (Core Elective - I)

Course Objective: Various types of Intellectual Property Rights Patentable Subject History of Indian Patent Protection, Patent filing procedure in India, Opposition- pre-grant opposition and post-grant opposition, Patent filing procedure under PCT, advantages, patent search and literature and Salient features of Indian Patents are discussed in detail.

Course Outcome: The clear information about the patent laws, intellectual property rights and drug regulation in India and abroad is gained by the students.

UNIT - I

Introduction, Types of Intellectual Property Rights (Patents, Trademarks, Copyrights, Geographical Indications Industrial Designs and Trade secrets), Patentable Subject Matter (Novelty, Non-Obviousness, Utility, enablement and Best mode),

UNIT - II

a. History of Indian Patent Protection, Rationale behind Patent System, Objectives and Advantages of Patent System, and future challenges. Indian Patents Act 1970, Definitions and Key Terminology, Types of Patent applications, Inventions not patentable (section 3 and 4).
b. Patent filing procedure in India (Patent Prosecution), Specifications (Provisional and Complete), Claims- types of claims and legal importance of claims, Grant of patent, Rights of Patentee and co-owners
c. Opposition- pre-grant opposition and post-grant opposition, Anticipation, Infringement, Compulsory Licensing, revocation of patents, and power of Controller.
d. Patent filing procedure under PCT, advantages, patent search and literature

UNIT - III

a. Salient features of Indian Patents (Amendments) Act 1999, 2002 and 2005. US and European Patent System,
b. Background, Salient Features and Impact of International Treaties / Conventions like
    1. Paris Convention, Berne convention
    2. World Trade Organization (WTO)
    3. World Intellectual Property Organization (WIPO)
    4. Trade Related Aspects of Intellectual Property Rights (TRIPS)
    5. Patent Co-operation Treaty (PCT), Mandrid Protocol

UNIT - IV

a. PCT Application procedure and review procedure
b. National phase application procedure for US& EU
c. Patent procecution procedure in US and EU
d. WIPO and its role in IPR
e. Hatch- Waxman provision for IPR

UNIT - V

a. Patent in validation process in India, US and Europe
b. IPR related to copyright, trade mark, trade secret and geographical indication.
c. Patent application writing
d. Claim construction and claims.

RECOMMENDED BOOKS:

1. Research Methodology concepts and cases by Depak Chawla, Neena Sondhi
2. Draft manual of Patent Practice and Procedure -2008 , The Patent Office, India
3. Manual of Patent Office Practice and Procedure -2010
4. Original Laws Published by Govt. of India
5. Protection of Industrial Property rights by P. Das and Gokul Das
6. Law and Drugs, Law Publications by S.N. Katju
7. Laws of drugs in India, Hussain
8. New drug approval process, 5th edition, by Guarino
9. Commercial Manual on Drugs and Cosmetics 2004, 2nd edition
10. Drugs and Cosmetics act by Vijay Malik
11. Good Manufacturing Practices for Pharmaceuticals, S.H. Wiling, Vol. 78, Marcel Decker.
12. fda.org,wipo.int,patentlawlinks.com, hc-sc.gc.ca,ich.org,cder.org
13. Current good manufacturing practices for pharmaceuticals by Manohar A. Potdar

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmaceutics/Pharmaceutical Technology)

PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS (Open Elective – I)

Course Objective:
This course enables students to understand various pharmacoepidemiological methods and their clinical applications. Also, it aims to impart knowledge on basic concepts, assumptions, terminology, and methods associated with Pharmacoeconomics and health related outcomes, and when should be appropriate Pharmacoeconomic model should be applied for a health care regimen.

Course Outcome: Upon completion of this course it is expected that students shall be able to:

- Understand the various epidemiological methods and their applications
- Understand the fundamental principles of Pharmacoeconomics.
- Identify and determine relevant cost and consequences associated with pharmacy products and services.
- Perform the key Pharmacoeconomics analysis methods
- Understand the Pharmacoeconomic decision analysis methods and its applications.
- Describe current Pharmacoeconomic methods and issues.
- Understand the applications of Pharmacoeconomics to various pharmacy settings.

UNIT- I
Introduction to Pharmacoepidemiology:
Definition, Scope, Need, Aims & Applications; Outcome measurement: Outcome measures, Drug use measures: Monetary units, Number of prescriptions, units of drug dispensed, defined daily doses, prescribed daily doses, Diagnosis and Therapy surveys, Prevalence, Incidence rate, Monetary units, number of prescriptions, unit of drugs dispensed, defined daily doses and prescribed daily doses, medications adherence measurements. Concept of risk: Measurement of risk, Attributable risk and relative risk, Time- risk relationship and odds ratio

UNIT- II
Pharmacoepidemiological Methods:
Qualitative models: Drug Utilization Review; Quantitative models: case reports, case series, Cross sectional studies, Cohort and case control studies, Calculation of Odds' ratio, Meta analysis models, Drug effects study in populations: Spontaneous reporting, Prescription event monitoring, Post marketing surveillance, Record linkage systems, Applications of Pharmacoepidemiology

UNIT- III
Introduction to Pharmacoeconomics:
Definition, history of Pharmacoeconomics, Need of Pharmacoeconomic studies in Indian healthcare system. Cost categorization and resources for cost estimation: Direct costs. Indirect costs. Intangible costs. Outcomes and Measurements of Pharmacoeconomics: Types of outcomes: Clinical outcome, Economic outcomes, Humanistic outcomes; Quality Adjusted Life Years, Disability Adjusted Life Years Incremental Cost Effective Ratio, Average Cost Effective Ratio. Person Time, Willingness To Pay, Time Trade Off and Discounting.

UNIT- IV
Pharmacoeconomic evaluations:
Definition, Steps involved, Applications, Advantages and disadvantages of the following Pharmacoeconomic models: Cost Minimization Analysis (CMA), Cost Benefit Analysis (CBA), Cost

Effective Analysis (CEA), Cost Utility Analysis (CUA), Cost of Illness (COI), Cost Consequences Analysis (COA).

UNIT - V

Definition, Steps involved, Applications, Advantages and disadvantages of the following:

Health related quality of life (HRQOL): Definition, Need for measurement of HRQOL, Common HRQOL measures. Definition, Steps involved, Applications of the following: Decision Analysis and Decision tree, Sensitivity analysis, Markov Modeling, Software used in pharmacoeconomic analysis, Applications of pharmacoeconomics.

REFERENCES:

1. Rascati K L. Essentials of Pharmacoeconomics, Woulters Kluwer Lippincott Williams & Wilkins, Philadelphia.
2. Thomas E Getzen. Health economics. Fundamentals and Flow of Funds. John Wiley & Sons, USA.
3. Andrew Briggs, Karl Claxton, Mark Sculpher. Decision Modelling for Health Economic Evaluation, Oxford University Press, London.
4. K G Revikumar, Pharmacoepidemiology and Pharmacoeconomics Concepts and Practices.
5. Michael Drummond, Mark Sculpher, George Torrence, Bernie O'Brien and Greg Stoddart. Methods for the Economic Evaluation of Health Care Programmes Oxford University Press, London.
6. George E Mackinnon III. Understanding health outcomes and pharmacoeconomics.
7. Graker, Dennis. Pharmacoeconomics and outcomes.
8. Walley, Pharmacoeconomics.
9. Pharmacoeconomic – ed. by Nowakowska – University of Medical Sciences, Poznan.
10. Relevant review articles from recent medical and pharmaceutical literature
11. Guru Prasad Mohanta and P K Manna, Textbook of Pharmacovigilance Concepts and Practice

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I Year – I Sem M.Pharm. (Pharmaceutics/Pharmaceutical Technology)

DRUG REGULATORY AFFAIRS (Open Elective – I)

Course Objective: The topics which are present in the Drug regulatory affairs are very much useful which increases the knowledge regarding the regulatory aspects in the pharmaceutical industries.

Course Outcomes:

- Students will come to know the different competent regulatory authorities globally.
- Students be aware of technical aspects pertaining to the marketing authoritization application (MAA)
- The regulatory guidelines and directions framed by the regulatory authorities will be helpful to place the drug products in market for marketing approvals.

UNIT - I

A study of regulatory aspects that affect drug product design, manufacture and distribution in India with special emphasis on the detailed study of the following Acts (with latest amendments)

UNIT - II

The Drugs and Cosmetics Act, 1940 and Rules there under. Recent amendments to Drugs and Cosmetic Act and other relevant rules.
Drugs (Price Control) Order in force. Loan license (contract manufacture). Certification and licensing procedures.

UNIT - III

A detailed study of regulatory aspects that affect drug product design, manufacture and distribution in a developed country such as USA and in a developing country such as Brazil, Hatch Waxmann Act;
Bolar Provisions and other FDA Regulations. Regulatory aspects of pharmaceutical and bulk drug manufacture, regulatory drug analysis.

UNIT - IV

Documentation related to manufacturing, cleaning methods, retention samples and records, quality control, batch release documents, distribution records, complaints and recalls.
Quality, safety and legislation for cosmetic products and herbal products.

UNIT - V

Governing Regulatory Bodies across the globe.

Country Authority Submission

a. U.S Food & Drug Administration USDMF
b. Canada Therapeutic Product Directorate DMF
c. Europe
    1) European Medicines Agency (EMEA/ National Authorities) EDMF
    2) European Directorate for Quality of Medicines CEP/COS & Health Care Products
d. Product Filing
e. Responding Regulatory Deficiencies
f. Final Approval Procedure

Preparation, review, and submission of Drug Master Files to Regulatory Authorities as per their specific requirements.

TEXT AND REFERENCE BOOKS:

1. Original laws published by Govt. of India.
2. Text Book of Forensic Pharmacy by Mithal B. M.; Vallabh Prakashan, New Delhi.
3. Laws of Drugs in India by Hussain.
4. Text Book of Forensic Pharmacy by Jain N. K.; Vallabh Prakashan, New Delhi.
5. Pharmaceutical Regulatory Affairs - Selected Topics, CVS Subramanyam and J Thimmasetty, Vallabha Prakashan Delhi - 2013

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmaceutics and Pharmaceutical Technology)

HERBAL COSMETICS TECHNOLOGY (Open Elective - I)

Course Objective:
The topics helps the students to get exposed to processes involved in the manufacturing of herbal cosmetics including the skin and hair care herbal products preparation and their evaluation

Course Outcome: Students will learn about the raw materials used in herbal cosmetics and get exposed to various preparations herbal cosmetics.

UNIT - I

a) Introduction, historical background and present status of Herbal cosmetics
b) Processes used in the manufacture of cosmetics-Emulsification, Mixing, compaction, Moulding, Packing. Raw materials used in preparation of herbal cosmetics
c) Machinery and Equipment for Cosmetics: Cream, Liquid, Powder and emulsion making machinery
d) Quality, safety and efficacy of Herbal cosmetics

UNIT - II

Skin care Products: Method of preparation, pharmaceutical and Pharmacological evaluation procedures for various formulations like Creams, Lotions, Lipsticks, face packs. Elaborative study of five formulations under each category with regard to their composition and claims for various herbs used in them.

UNIT - III

Hair care Products: Method of preparation, pharmaceutical and Pharmacological evaluation procedures for various formulations like hair dyes, creams, Lotions, Jels, oils and Shampoos. Elaborative study of five formulations under each category with regard to their composition and claims for various herbs used in them.

UNIT - IV

A brief account of following herbals or herb extracts or herbal products of cosmetic importance such as *Acacia concinna* pods, Aloe Vera, Almond oil, Neem, *Citrus aurantium* peels, Henna, Turmeric, Liquorice, Olive oil, tea tree oil and wheat germ oil with special emphasis on their source, active principles and cosmetic properties.

UNIT - V

a) General Principles of Quality control and standardization of cosmetics-Raw material control, Packaging material control, finished product control, Shelf testing.
b) Natural colorants : Biological Source, coloring principles, chemical nature and usage of the following Annato, Cochineal, Caramel, Henna, Indigo, Madder, Saffron , Turmeric
c) Flavors and Perfumes : Sandal wood oil, Orange oil, Lemon oil, Vanilla, Palmarosa, geranium oil

REFERENCES:

1. Cosmetics- Formulation, Manufacturing and Quality control –P.P. Sharma
2. Herbal Cosmetics Hand Book- H. Panda
3. Herbal Cosmetics by P. K Chattopadhyay
4. The Complete Technology Book on Herbal Perfumes and Cosmetics by H. Panda

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I Year – I Sem. M. Pharm. (Pharmaceutics/ Pharmaceutical Technology)

PHARMACEUTICAL VALIDATION (Open Elective – I)

Course Objective:
The main purpose of the subject is to understand about validation and how it can be applied to industry and thus to improve the quality of the products. The subject covers the complete information about validation, types, methodology and application.

Course Outcome: Upon completion of the subject student shall be able to

- Explain the aspect of validation
- Carryout validation of manufacturing processes
- Apply the knowledge of validation to instruments and equipments
- Validate the manufacturing facilities

UNIT - I
Introduction: Definition of Qualification and Validation, Advantage of Validation, Streamlining of Qualification & Validation process and Validation Master Plan.

UNIT - II
Qualification: User Requirement Specification, Design Qualification, Factory Acceptance Test (FAT)/ Site Acceptance Test (SAT), Installation Qualification, Operational Qualification, Performance Qualification, Re- Qualification (Maintaining status-Calibration Preventive Maintenance, Change management),Qualification of Manufacturing Equipments, Qualification of Analytical Instruments and Laboratory equipments.

UNIT - III
Qualification of analytical instruments: Electronic balance, Ph meter, UV-Visible spectrophotometer, FTIR, GC, HPLC, HPTLC
Qualification of Glassware: Volumetric flask, pipette, Measuring cylinder, beakers and burette.

UNIT - IV
Validation of Utility systems: Pharmaceutical Water System &pure steam, HVAC system, Compressed air and nitrogen.
Cleaning Validation: Cleaning Validation - Cleaning Method development, Validation and validation of analytical method used in cleaning. Cleaning of Equipment, Cleaning of Facilities. Cleaning in place (CIP).

UNIT - V
Analytical method validation: General principles, Validation of analytical method as per ICH guidelines and USP.

REFERENCES:
1. B. T. Loftus & R. A. Nash, "Pharmaceutical Process Validation", Drugs and Pharm Sci. Series, Vol. 129, 3rd Ed., Marcel Dekker Inc., N.Y.
2. The Theory & Practice of Industrial Pharmacy, 3rd edition, Leon Lachman, Herbert A. Lieberman, Joseph. L. Karig, Varghese Publishing House, Bombay.
3. Validation Master plan by Terveeks or Deeks, Davis Harwood International publishing.
4. Validation of Aseptic Pharmaceutical Processes, 2nd Edition, by Carleton & Agalloco, (Marcel Dekker).

5. Michael Levin, Pharmaceutical Process Scale-Upll, Drugs and Pharm. Sci. Series, Vol. 157, 2nd Ed., Marcel Dekker Inc., N.Y.
6. Validation Standard Operating Procedures: A Step by Step Guide for Achieving Compliance in the Pharmaceutical, Medical Device, and Biotech Industries, Syed Imtiaz Haider
7. Pharmaceutical Equipment Validation: The Ultimate Qualification Handbook, Phillip A. Cloud, Interpharm Press
8. Validation of Pharmaceutical Processes: Sterile Products, Frederick J. Carlton (Ed.) and James Agalloco (Ed.), Marcel Dekker, 2nd Ed.
9. Analytical Method validation and Instrument Performance Verification by Churg Chan, Heiman Lam, Y.C. Lee, Yue. Zhang, Wiley Inter Science.

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I Year – I Sem M. Pharm. (Pharmaceutics/Pharmaceutical Technology)

PHARMACEUTICAL MANAGEMENT (Open Elective – I)

Course Objective: The topics which are present in the pharmaceutical management are very much useful to the students in personality development become a perfect pharma professional.

Course Outcomes:

- These topics are useful for the students to know how to manage a pharma industry and its various departments viz QA, QC, RA, Production etc.
- Along with this it aids the students to develop leadership qualities, communication &interpersonal skills, decisions making, motivation, organization &various managerial functions &professional skills required for a dynamic professional.
- Management helps to understand the concept of managerial control, its levels &role, importance in pharma industry

UNIT - I

Pharmaceutical Management: Meaning, Evolution-scientific, administrative and human relation approach. Process of management: Planning, organizing, staffing, directing, coordinating and controlling–a preliminary idea of concepts, processes and techniques.

UNIT - II

Fundamental concepts of production, financial, personal, legal and marketing functions with special reference to Pharmaceutical Management. Introduction to budgeting, costing, accounting, auditing, and budgetary control. Entrepreneurship development.

UNIT - III

Understanding organizations: Meaning, process, types of organization structures and departmentation, line/staff authority, promoting organizational culture. Organizations, pharmaceutical services and functioning of hospital pharmacy, bulk drug unit, formulation unit, Ayurvedic and Unani manufacturing units and testing labs etc.

UNIT - IV

Professional Mangers; Tasks, responsibilities and skills needed. Leadership; Styles and managing change. Decision Making; Types, procedures, evaluation and selection of alternatives, decision making under various situations. Management information and decision support systems and time management.

Personnel Management: Job Analysis, recruitment, selection, orientation and training, performance appraisal and compensation. Retrenchment, lay off and discharge.

UNIT - V

Management of Industrial Relations: Industrial disputes, settlement of disputes through various routes such as bargaining, etc.

Motivational aspects, theories of motivation, group dynamics, rewards and incentives, interpersonal skills, significance of communication, its processes, measures for effective communication, conflict management. Stress management.

TEXT AND REFERENCE BOOKS:

1. Marketing Management by Philip Kotlar; Prentice-Hall of India Ltd., New Delhi.
2. Management and Organization by Louis A. Allen; McGraw Hill, Tokyo

3. Corporate Strategy by Ansoff, H.T.; McGraw Hill, New York.
4. Modern Management by Hempran David R.; McGraw Hill, New York.
5. Management by Stoner and Freeman; Prentice Hall, New Delhi.
6. Motivation and Personality by Maslow, Abraham, Harper & Row, New York.
7. Management of Organizational Behavior, Utilizing the Human Resources by Harcey, Paul and Blanchard Kenneth; Prentice Hall of India, New Delhi
8. Organization Structure, Process and out comes V th Edition Richard. H. Hall
9. Principles and Methods of Pharmacy Management III rd Edition Harry A. Smith.
10. Management "Global Perspective Heinz Weihrich, Harold Koontz by Tata Mcgraw Hill".
11. Personnel Management and Industrial Relations by P. C. Tripathi.

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I Year – I Sem M. Pharm. (Pharmaceutics/Pharmaceutical Technology)

ADVANCED PHYSICAL PHARMACEUTICS LAB

List of experiments

1. Determinates of molecular weight of some selected polymers.
2. Preparation and evaluation of solid dispersions (Immediate release and sustained release)
3. Accelerated stability testing of Aspirin Tablets
4. Stability evaluation of Aspirin at various pH and temperature conditions
5. Determination of Ist order and 2^{nd} order rate constant. Half life by Acid / Alkali hydrolysis
6. Preparation and evaluation of multiple emulsions
7. Preparation and evaluation of β-cyclodextrin complexes of some drugs.
8. Generation of dissolution profiles of few dosage forms and application of the data into various kinetic equations. Calculation of Hixon-crowell dissolution rate constant
9. Preparation and dissolution study of paracetamol tablets and comparison with the marketed product.
10. Study of solubility and dissolution for few drugs and their respective salts.
11. Study of drug release from commercial suspension and emulsion dosage forms
12. Viscosity measurement of Newtonian and Non-Newtonian liquids

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I Year – I Sem M.Pharm. (Pharmaceutics/Pharmaceutical Technology)

APPLIED BIOPHARMACEUTICS AND PHARMACOKINETICS LAB

List of experiments

1. Intrinsic dissolution (1 exp)
2. Analysis of dissolution by various data-kinetic modelling.
3. Dissolution of immediate release, sustained release and delayed release.
4. Evaluation of drug-protein binding analysis
5. Assignment of numerical problems, one compartment and two compartment disposition, method of residuals, AUC and evaluation of pharmacokinetic parameters.
6. Calculation of K_a(absorption rate constant) absorption curve- Wagner nelson method , Loo-Riegel method.
7. Calculation of pharmacokinetics parameters of one compartment oral data and two compartment IV data.
8. Constuction of IVIVE from the data
9. Calculation of Urinary Pharmacokinetics
10. Permeation studies of Franz diffusion cell
11. Drug Release from semisolids by Agargel method or Franz diffusion cell.

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M. Pharmacy (PHARMACEUTICAL ANALYSIS & QUALITY ASSURANCE) / (QUALITY ASSURANCE)

COURSE STRUCTURE AND SYLLABUS
Effective from Academic Year 2017-18 Admitted Batch

I Year – I Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course I	Advanced Pharmaceutical Analysis	25	75	4	--	4
Core Course II	Food Analysis	25	75	4	--	4
Core Course III	Modern Pharmaceutical Analytical Techniques	25	75	4	--	4
Core Elective I	1. Pharmaceutical Validation 2. Intellectual Property Rights	25	75	4	--	4
Open Elective I	1. Drug Regulatory Affairs 2. Pharmacoepidemiology and Pharmacoeconomics 3. Pharmaceutical Management 4. Herbal Cosmetics Technology 5. Pharmaceutical Formulation Technology	25	75	4	--	4
Laboratory I	Modern Pharmaceutical Analytical Techniques Lab	25	75	-	-6	3
Laboratory II	Advanced Pharmaceutical Analysis Lab	25	75	--	6	3
Seminar I	Seminar	100	--	--	4	2
Total Credits		**275**	**525**	**20**	**16**	**28**

I Year – II Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course IV	Advanced Instrumental Analysis	25	75	4	--	4
Core Course V	Quality Control and Quality Assurance	25	75	4	--	4
Core Course VI	Modern Bio analytical Techniques	25	75	4	--	4
Core Elective II	1. Biostatistics And Research Methodology 2. Spectral Analysis	25	75	4	--	4
Open Elective II	1. Screening Methods in Pharmacology 2. Stability of Drugs and Dosage Forms 3. Entrepreneurship management 4. Nano Based Drug Delivery Systems 5. Herbal & Cosmetics Analysis	25	75	4	--	4
Laboratory III	Advanced Instrumental Analysis Lab	25	75	-	6	4
Laboratory IV	Quality Control and Quality Assurance Lab	25	75	--	6	2
Seminar II	Seminar	100	--	--	4	2
Total Credits		**275**	**525**	**20**	**16**	**28**

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II Year - I Semester

Course Title	Int. marks	Ext. marks	L	P	C
Comprehensive Viva-Voce	--	100	--	--	4
Project work Review II	100	--	--	24	12
Total Credits	**100**	**100**	--	24	**16**

II Year - II Semester

Course Title	Int. marks	Ext. marks	L	P	C
Project work Review III	100	--	--	8	4
Project Evaluation (Viva-Voce)	--	100	--	16	12
Total Credits	**100**	**100**	**--**	**24**	**16**

$ For Project review I, please refer 7.9 in R17 Academic Regulations

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I Year – I Sem M. Pharm. (PAQA /QA)

ADVANCED PHARMACEUTICAL ANALYSIS (Core course–I)

Course Objective: The principles and procedures for the determination of various pharmaceutical bulk drugs and their formulations belonging to different categories are discussed in detail. The applications of the important reagents like MBTH, FC, PDAB etc. in the determination of the pharmaceuticals are also discussed.

Course Outcome: The quantitative determination of various organic compounds is clearly understood. The spectral analysis, dissolution parameters and microbial assays are also learned.

UNIT - I

Principles and procedures involved in the determination of the official compounds in IP with the following analytical techniques

A. Non-aqueous
B. Oxidation-reduction
C. Complexometric
D. Diazotization methods

UNIT - II

A detailed study of the principles and procedures involved in the quantitative determination of the following organic functional groups

A. Amines
B. Esters
C. Carbonyl compounds
D. Hydroxy and carboxyl
E. Amino Acids

UNIT - III

a. **Reference Standards:** Types, preparation methods and uses.

b. Principles and procedures involved in using the following reagents in the determination of pharmaceutical dosage forms official in IP

a. MBTH (3-methyl-2-benzothiazolone hydrazone)
b. F.C. Reagent (Folin-Ciocalteu)
c. PDAB (*para*-Dimethyl Amino Benzaldehyde)
d. 2, 3, 5 - *tri*Phenyltetrazolium salt
e. 2,6 *di* -ChloroquinoneChlorimide
f. *N* - (1-naphthyl) ethylenediaminedihydrochloride (B.M. Reagent)
g. Carr – Price Reagent
h. 2,4 - DNP

UNIT- IV

a. **Atomic Absorption Spectrometry (AAS):** Principle, instrumentation, sample automization techniques, interferences. Elemental analysis such as determination of Sodium, Potassium, Calcium, Chlorine, Bromine and Iodine.
b. **Radio chemical methods including RIA:** Radio Active Isotopes, tagging of compounds, Labeled Reagents, Isotope dilution Analysis, Scintillation counter, RIA.

UNIT - V

a. **Dissolution Tests :** Types of Dissolution apparatus, dissolution test requirements for immediate release, delayed release, extended release dosage forms, coated ,uncoated, enteric coated, gelatin capsules etc..

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b. **Microbiological assays and Biological tests:** Antimicrobial effectiveness testing, microbial limit tests, sterility test. Antibiotics-microbial assays, bacterial endotoxins test.

TEXT BOOKS

1. Pharmaceutical Chemistry by Becket and Stanlake
2. Pharmaceutical Analysis by Higuchi, Bechmman and Hassan
3. Instrumental Methods of Chemical Analysis By B.K. Sharma
4. A Text Book of Pharmaceutical Analysis by Kennenth A. Conners

REFERENCES:

1. Remington's Pharmaceutical Sciences by Alfonso and Gennaro
2. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P.D. Sethi
3. Indian Pharmacopoeia 2010
4. Journals (Indian Drugs, IJPS etc.)

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I Year – I Sem M. Pharm. (PAQA / QA)

FOOD ANALYSIS (Core course–II)

Course Objective:
This course is designed to impart knowledge on analysis of food constituentsand finished food products. The course includes application of instrumentalanalysis in the determination of pesticides in variety of food products.

Course Outcome: At completion of this course student shall be able to understand various analytical techniques in the determination of

- Food constituents
- Food additives
- Finished food products
- Pesticides in food
- And also student shall have the knowledge on food regulations and legislations

UNIT - I

a. **Carbohydrates:** Classification and properties of foodcarbohydrates, General methods of analysis of foodcarbohydrates,
b. **Proteins**: Chemistry and classification of amino acids andproteins, Physico-Chemical properties of protein and theirstructure, general methods of analysis of proteins and amino acids

UNIT - II

Lipids: Classification, general methods of analysis, refining of fatsand oils; hydrogenation of vegetable oils, Determination ofadulteration in fats and oils,

UNIT - III

a. **Quality Control of Excipients:** Tests related to excipients such as bulk density, tapped density, particle size distribution, pH, moisture content, viscosity (dynamic), loss on drying, ash content, conductivity.
b. **Excipients of interest:** disintegrating agents, binders, emulsifiers, viscosity modifiers and preservatives including preservative challenge test.

UNIT - IV

Vitamins: Classification of vitamins, methods of analysis of vitamins, Principles of microbial assay of vitamins of B-series

UNIT - V

In process quality control tests carried on the following dosage forms
A. Tablets B. Capsules C. Parenterals D. Liquid Orals

TEXT BOOKS:

1. Pharmaceutical Chemistry by Beckett and Stanlake
2. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P.D.Sethi
3. Pharmaceutical Analysis by Higuchi, Bechmman and Hassan
4. Theory and Practice of Industrial Pharmacy by Lieberman and Lachman
5. Ahuja S, Alsante KM. Handbook of isolation and characterization of impurities in pharmaceuticals. Academic press, California, 2003

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REFERENCE BOOKS:

1. Remington's Pharmaceutical Sciences by Alfonso and Gennaro
2. David Pearson. The Chemical Analysis of Foods, 7th ed., Churchill Livingstone, Edinburgh, 1976.
3. Nielsen S. Introduction to the chemical analysis of foods. Jones & Bartlett Publishers, Boston, 1974
4. Indian Pharmacopoeia 2012

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PAQA / QA)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (Core course - III)

Course Objective: The course is designed to impart the knowledge in the field of Pharmaceutical Analysis. The various modern analytical techniques like UV-Visible, IR, NMR, Mass, GC, HPLC, different chromatographic methods and other important topics are taught to enable the students to understand and apply the principles involved in the determination of different bulk drugs and their formulation. In addition to the theoretical aspects, the basic practical knowledge relevant to the analysis is also imparted.

Course Outcome: Appreciable knowledge will be gained by the students in the Modern Analytical Techniques and can apply the theories in the Analysis of various bulk drugs and their formulations. The students will also be in a position to apply their knowledge in developing the new methods for the determination and validate the procedures.

UNIT - I

Introduction to chromatography and classification of chromatographic methods based on the mechanism of separation

a. Column Chromatography: Adsorption and partition, theory, preparation, procedure and methods of detection
b. Thin Layer Chromatography: Theory, preparation, procedures, detection of compounds
c. Paper Chromatography: Theory, different techniques employed, filter papers used, qualitative and quantitative detection
d. Counter – current extraction, solid phase extraction techniques, gel filtration

UNIT - II

a. **Gas chromatography:** Introduction, fundamentals, instrumentation, columns: preparation and operation, detection, dramatization.
b. **HPLC:** Principles and instrumentation, solvents and columns used, detection and applications
c. **HPTLC:** Theory and principle, instrumentation, elution techniques and pharmaceutical applications

UNIT - III

a. **UV-Visible spectroscopy:** Introduction, electromagnetic spectrum, absorbance laws and limitations, instrumentation-design and working principle, chromophore concept, auxochromes, Wood-Fisher rules for calculating absorption maximum, applications of UV-Visible spectroscopy
b. **IR spectroscopy:** Basic principles-Molecular vibrations, vibrational frequency, factors influencing vibrational frequencies, sampling techniques, instrumentation, interpretation of spectra, FT-IR, theory and applications

UNIT - IV

Mass spectroscopy: Theory, ionization techniques: electron impact ionization, chemical ionization, field ionization, fast atom bombardment, plasma desorption, fragmentation process: types of fission, resolution, GC/MS, interpretation of spectra and applications for identification and structure determination.

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UNIT - V

NMR: Theory, instrumentation, chemical shift, shielding and deshielding effects, splitting of signals, spin-spin coupling, proton exchange reactions, coupling constant(J), nuclear overhauser effect(NOE), ^{13}C-NMR spectra and its applications, 2D-NMR, COSY and applications in pharmacy.

REFERENCES:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. A Text book of Pharmaceutical Analysis by Kerrenth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein
11. HPTLC by P.D. Seth
12. Indian Pharmacopoeia 2007
13. High Performance thin layer chromatography for the analysis of medicinal plants by Eike Reich, Anne Schibli
14. Introduction to instrumental analysis by Robert. D. Braun

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PAQA / QA)

PHARMACEUTICAL VALIDATION (Core Elective - I)

Course Objective: The main purpose of the subject is to understand about validation and how it can be applied to industry and thus to improve the quality of the products. The subject covers the complete information about validation, types, methodology and application.

Course Outcome: Upon completion of the subject student shall be able to

- Explain the aspect of validation
- Carryout validation of manufacturing processes
- Apply the knowledge of validation to instruments and equipments
- Validate the manufacturing facilities

UNIT - I

Introduction: Definition of Qualification and Validation, Advantage of Validation, Streamlining of Qualification & Validation process and Validation Master Plan.

UNIT - II

Qualification: User Requirement Specification, Design Qualification, Factory Acceptance Test (FAT)/ Site Acceptance Test (SAT), Installation Qualification, Operational Qualification, Performance Qualification, Re - Qualification (Maintaining status-Calibration Preventive Maintenance, Change management),Qualification of Manufacturing Equipments, Qualification of Analytical Instruments and Laboratory equipments.

UNIT - III

Qualification of analytical instruments: Electronic balance, Ph meter, UV-Visible spectrophotometer, FTIR, GC, HPLC, HPTLC

Qualification of Glassware: Volumetric flask, pipette, Measuring cylinder, beakers and burette.

UNIT - IV

Validation of Utility systems: Pharmaceutical Water System &pure steam, HVAC system, Compressed air and nitrogen.

Cleaning Validation: Cleaning Validation - Cleaning Method development, Validation and validation of analytical method used in cleaning. Cleaning of Equipment, Cleaning of Facilities. Cleaning in place (CIP).

UNIT - V

Analytical method validation: General principles, Validation of analytical method as per ICH guidelines and USP.

REFERENCES:

1. B. T. Loftus & R. A. Nash, "Pharmaceutical Process Validation", Drugs and Pharm Sci. Series, Vol. 129, 3rd Ed., Marcel Dekker Inc., N.Y.
2. The Theory & Practice of Industrial Pharmacy, 3rd edition, Leon Lachman, Herbert A. Lieberman, Joseph. L. Karig, Varghese Publishing House, Bombay.
3. Validation Master plan by Terveeks or Deeks, Davis Harwood International publishing.
4. Validation of Aseptic Pharmaceutical Processes, 2nd Edition, by Carleton & Agalloco, (Marcel Dekker).

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5. Michael Levin, Pharmaceutical Process Scale-Upǁ, Drugs and Pharm. Sci. Series, Vol. 157, 2nd Ed., Marcel Dekker Inc., N.Y.
6. Validation Standard Operating Procedures: A Step by Step Guide for Achieving Compliance in the Pharmaceutical, Medical Device, and Biotech Industries, Syed Imtiaz Haider
7. Pharmaceutical Equipment Validation: The Ultimate Qualification Handbook, Phillip A. Cloud, Interpharm Press
8. Validation of Pharmaceutical Processes: Sterile Products, Frederick J. Carlton (Ed.) and James Agalloco (Ed.), Marcel Dekker, 2nd Ed.
9. Analytical Method validation and Instrument Performance Verification by Churg Chan, Heiman Lam, Y.C. Lee, Yue. Zhang, Wiley Inter Science.

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I Year – I Sem M. Pharm. (PAQA / QA)

INTELLECTUAL PROPERTY RIGHTS (Core Elective – I)

Course Objective: Various types of Intellectual Property Rights Patentable Subject History of Indian Patent Protection, Patent filing procedure in India, Opposition- pre-grant opposition and post-grant opposition, Patent filing procedure under PCT, advantages, patent search and literature and Salient features of Indian Patents are discussed in detail.

Course Outcome: The clear information about the patent laws, intellectual property rights and drug regulation in India and abroad is gained by the students.

UNIT - I

Introduction, Types of Intellectual Property Rights (Patents, Trademarks, Copyrights, Geographical Indications Industrial Designs and Trade secrets), Patentable Subject Matter (Novelty, Non-Obviousness, Utility, enablement and Best mode),

UNIT - II

a. History of Indian Patent Protection, Rationale behind Patent System, Objectives and Advantages of Patent System, and future challenges. Indian Patents Act 1970, Definitions and Key Terminology, Types of Patent applications, Inventions not patentable (section 3 and 4).
b. Patent filing procedure in India (Patent Prosecution), Specifications (Provisional and Complete), Claims- types of claims and legal importance of claims, Grant of patent, Rights of Patentee and co-owners
c. Opposition- pre-grant opposition and post-grant opposition, Anticipation, Infringement, Compulsory Licensing, revocation of patents, and power of Controller.
d. Patent filing procedure under PCT, advantages, patent search and literature

UNIT - III

a. Salient features of Indian Patents (Amendments) Act 1999, 2002 and 2005. US and European Patent System,
b. Background, Salient Features and Impact of International Treaties / Conventions like
   1. Paris Convention, Berne convention
   2. World Trade Organization (WTO)
   3. World Intellectual Property Organization (WIPO)
   4. Trade Related Aspects of Intellectual Property Rights (TRIPS)
   5. Patent Co-operation Treaty (PCT), Madrid Protocol

UNIT - IV

a. PCT Application procedure and review procedure
b. National phase application procedure for US& EU
c. Patent prosecution procedure in US and EU
d. WIPO and its role in IPR
e. Hatch- Waxman provision for IPR

UNIT - V

b. Patent in validation process in India, US and Europe
c. IPR related to copyright, trade mark, trade secret and geographical indication.
d. Patent application writing
e. Claim construction and claims.

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RECOMMENDED BOOKS:

1. Research Methodology concepts and cases by Depak Chawla, Neena Sondhi
2. Draft manual of Patent Practice and Procedure -2008 , The Patent Office, India
3. Manual of Patent Office Practice and Procedure -2010
4. Original Laws Published by Govt. of India
5. Protection of Industrial Property rights by P. Das and Gokul Das
6. Law and Drugs, Law Publications by S. N. Katju
7. Laws of drugs in India, Hussain
8. New drug approval process, 5th edition, by Guarino
9. Commercial Manual on Drugs and Cosmetics 2004, 2nd edition
10. Drugs and Cosmetics act by Vijay Malik
11. Good Manufacturing Practices for Pharmaceuticals, S.H. Wiling, Vol. 78, Marcel Decker.
12. fda.org,wipo.int,patentlawlinks.com, hc-sc.gc.ca,ich.org,cder.org
13. Current good manufacturing practices for pharmaceuticals by Manohar A. Potdar
14. Pharmaceutical Regulatory affairs –selected topics. CVS subhramanyam and J Thimma settee. Delhi, Vallabha Prakasham, 2012

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I Year – I Sem M. Pharm (PAQA / QA)

DRUG REGULATORY AFFAIRS (Open Elective - I)

Course Objective: The topics which are present in the Drug regulatory affairs are very much useful which increases the knowledge regarding the regulatory aspects in the pharmaceutical industries.

Course Outcomes:

- Students will come to know the different competent regulatory authorities globally.
- Students be aware of technical aspects pertaining to the marketing authoritization application (MAA)
- The regulatory guidelines and directions framed by the regulatory authorities will be helpful to place the drug products in market for marketing approvals.

UNIT - I

A study of regulatory aspects that affect drug product design, manufacture and distribution in India with special emphasis on the detailed study of the following Acts (with latest amendments)

UNIT - II

The Drugs and Cosmetics Act, 1940 and Rules there under. Recent amendments to Drugs and Cosmetic Act and other relevant rules.

Drugs (Price Control) Order in force. Loan license (contract manufacture). Certification and licensing procedures.

UNIT - III

A detailed study of regulatory aspects that affect drug product design, manufacture and distribution in a developed country such as USA and in a developing country such as Brazil, Hatch Waxmann Act;

Bolar Provisions and other FDA Regulations. Regulatory aspects of pharmaceutical and bulk drug manufacture, regulatory drug analysis.

UNIT - IV

Documentation related to manufacturing, cleaning methods, retention samples and records, quality control, batch release documents, distribution records, complaints and recalls.

Quality, safety and legislation for cosmetic products and herbal products.

UNIT - V

Governing Regulatory Bodies across the globe.

Country Authority Submission

a. U.S Food & Drug Administration USDMF
b. Canada Therapeutic Product Directorate DMF
c. Europe

1) European Medicines Agency (EMEA/ National Authorities) EDMF
2) European Directorate for Quality of Medicines CEP/COS & Health Care Products

d. Product Filing
e. Responding Regulatory Deficiencies
f. Final Approval Procedure

Preparation, review, and submission of Drug Master Files to Regulatory Authorities as per their specific requirements.

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TEXT AND REFERENCE BOOKS:

1. Original laws published by Govt. of India.
2. Text Book of Forensic Pharmacy by Mithal B. M.; Vallabh Prakashan, New Delhi.
3. Laws of Drugs in India by Hussain.
4. Text Book of Forensic Pharmacy by Jain N. K.; Vallabh Prakashan, New Delhi.
5. Pharmaceutical Regulatory Affairs - Selected Topics, CVS Subramanyam and J Thimmasetty, Vallabha Prakashan Delhi - 2013

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm (PAQA / QA)

PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS (Open Elective –I)

Course Objective:
This course enables students to understand various pharmacoepidemiological methods and their clinical applications. Also, it aims to impart knowledge on basic concepts, assumptions, terminology, and methods associated with Pharmacoeconomics and health related outcomes, and when should be appropriate Pharmacoeconomic model should be applied for a health care regimen.

Course Outcome: Upon completion of this course it is expected that students shall be able to:

- Understand the various epidemiological methods and their applications
- Understand the fundamental principles of Pharmacoeconomics.
- Identify and determine relevant cost and consequences associated with pharmacy products and services.
- Perform the key Pharmacoeconomics analysis methods
- Understand the Pharmacoeconomic decision analysis methods and its applications.
- Describe current Pharmacoeconomic methods and issues.
- Understand the applications of Pharmacoeconomics to various pharmacy settings.

UNIT- I
Introduction to Pharmacoepidemiology:
Definition, Scope, Need, Aims & Applications; Outcome measurement: Outcome measures, Drug use measures: Monetary units, Number of prescriptions, units of drug dispensed, defined daily doses, prescribed daily doses, Diagnosis and Therapy surveys, Prevalence, Incidence rate, Monetary units, number of prescriptions, unit of drugs dispensed, defined daily doses and prescribed daily doses, medications adherence measurements. Concept of risk: Measurement of risk, Attributable risk and relative risk, Time- risk relationship and odds ratio

UNIT- II
Pharmacoepidemiological Methods:
Qualitative models: Drug Utilization Review; Quantitative models: case reports, case series, Cross sectional studies, Cohort and case control studies, Calculation of Odds' ratio, Meta analysis models, Drug effects study in populations: Spontaneous reporting, Prescription event monitoring, Post marketing surveillance, Record linkage systems, Applications of Pharmacoepidemiology

UNIT- III
Introduction to Pharmacoeconomics:
Definition, history of Pharmacoeconomics, Need of Pharmacoeconomic studies in Indian healthcare system. Cost categorization and resources for cost estimation: Direct costs. Indirect costs. Intangible costs. Outcomes and Measurements of Pharmacoeconomics: Types of outcomes: Clinical outcome, Economic outcomes, Humanistic outcomes; Quality Adjusted Life Years, Disability Adjusted Life Years Incremental Cost Effective Ratio, Average Cost Effective Ratio. Person Time, Willingness To Pay, Time Trade Off and Discounting.

UNIT- IV
Pharmacoeconomic evaluations:
Definition, Steps involved, Applications, Advantages and disadvantages of the following Pharmacoeconomic models: Cost Minimization Analysis (CMA), Cost Benefit Analysis (CBA), Cost

Effective Analysis (CEA), Cost Utility Analysis (CUA), Cost of Illness (COI), Cost Consequences Analysis (COA).

UNIT - V

Definition, Steps involved, Applications, Advantages and disadvantages of the following:

Health related quality of life (HRQOL): Definition, Need for measurement of HRQOL, Common HRQOL measures. Definition, Steps involved, Applications of the following: Decision Analysis and Decision tree, Sensitivity analysis, Markov Modeling, Software used in pharmacoeconomic analysis, Applications of pharmacoeconomics.

REFERENCES:

1. Rascati K L. Essentials of Pharmacoeconomics, Woulters Kluwer Lippincott Williams & Wilkins, Philadelphia.
2. Thomas E Getzen. Health economics. Fundamentals and Flow of Funds. John Wiley & Sons, USA.
3. Andrew Briggs, Karl Claxton, Mark Sculpher. Decision Modelling for Health Economic Evaluation, Oxford University Press, London.
4. K G Revikumar, Pharmacoepidemiology and Pharmacoeconomics Concepts and Practices.
5. Michael Drummond, Mark Sculpher, George Torrence, Bernie O'Brien and Greg Stoddart. Methods for the Economic Evaluation of Health Care Programmes Oxford University Press, London.
6. George E Mackinnon III. Understanding health outcomes and pharmacoeconomics.
7. Graker, Dennis. Pharmacoeconomics and outcomes.
8. Walley, Pharmacoeconomics.
9. Pharmacoeconomic – ed. by Nowakowska – University of Medical Sciences, Poznan.
10. Relevant review articles from recent medical and pharmaceutical literature
11. Guru Prasad Mohanta and P K Manna, Textbook of Pharmacovigilance Concepts and Practice

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm (PAQA / QA)

PHARMACEUTICAL MANAGEMENT (Open Elective – I)

Course Objective: The topics which are present in the pharmaceutical management are very much useful to the students in personality development become a perfect pharma professional.

Course Outcomes:

- These topics are useful for the students to know how to manage a pharma industry and its various departments viz QA, QC, RA, Production etc.
- Along with this it aids the students to develop leadership qualities, communication &interpersonal skills, decisions making, motivation, organization &various managerial functions &professional skills required for a dynamic professional.
- Management helps to understand the concept of managerial control, its levels &role, importance in pharma industry

UNIT - I

Pharmaceutical Management: Meaning, Evolution-scientific, administrative and human relation approach. Process of management: Planning, organizing, staffing, directing, coordinating and controlling–a preliminary idea of concepts, processes and techniques.

UNIT - II

Fundamental concepts of production, financial, personal, legal and marketing functions with special reference to Pharmaceutical Management. Introduction to budgeting, costing, accounting, auditing, and budgetary control. Entrepreneurship development.

UNIT - III

Understanding organizations: Meaning, process, types of organization structures and departmentation, line/staff authority, promoting organizational culture. Organizations, pharmaceutical services and functioning of hospital pharmacy, bulk drug unit, formulation unit, Ayurvedic and Unani manufacturing units and testing labs etc.

UNIT - IV

Professional Mangers; Tasks, responsibilities and skills needed. Leadership; Styles and managing change. Decision Making; Types, procedures, evaluation and selection of alternatives, decision making under various situations. Management information and decision support systems and time management.

Personnel Management: Job Analysis, recruitment, selection, orientation and training, performance appraisal and compensation. Retrenchment, lay off and discharge.

UNIT - V

Management of Industrial Relations: Industrial disputes, settlement of disputes through various routes such as bargaining, etc.

Motivational aspects, theories of motivation, group dynamics, rewards and incentives, interpersonal skills, significance of communication, its processes, measures for effective communication, conflict management. Stress management.

TEXT AND REFERENCE BOOKS:

1. Marketing Management by Philip Kotlar; Prentice-Hall of India Ltd., New Delhi.
2. Management and Organization by Louis A. Allen; McGraw Hill, Tokyo.
3. Corporate Strategy by Ansoff, H.T.; McGraw Hill, New York.
4. Modern Management by Hempran David R.; McGraw Hill, New York.
5. Management by Stoner and Freeman; Prentice Hall, New Delhi.
6. Motivation and Personality by Maslow, Abraham, Harper & Row, New York.
7. Management of Organizational Behavior, Utilizing the Human Resources by Harcey, Paul and Blanchard Kenneth; Prentice Hall of India, New Delhi
8. Organization Structure, Process and out comes V th Edition Richard. H. Hall
9. Principles and Methods of Pharmacy Management III rd Edition Harry A. Smith.
10. Management "Global Perspective Heinz Weihrich, Harold Koontz by Tata Mcgraw Hill".
11. Personnel Management and Industrial Relations by P. C. Tripathi.

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I Year – I Sem M. Pharm (PAQA / QA)

HERBAL COSMETICS TECHNOLOGY (Open Elective - I)

Course Objective:
The topics helps the students to get exposed to processes involved in the manufacturing of herbal cosmetics including the skin and hair care herbal products preparation and their evaluation

Course Outcome: Students will learn about the raw materials used in herbal cosmetics and get exposed to various preparations herbal cosmetics.

UNIT - I

a) Introduction, historical background and present status of Herbal cosmetics
b) Processes used in the manufacture of cosmetics-Emulsification, Mixing, compaction, Moulding, Packing. Raw materials used in preparation of herbal cosmetics
c) Machinery and Equipment for Cosmetics: Cream, Liquid, Powder and emulsion making machinery
d) Quality, safety and efficacy of Herbal cosmetics

UNIT - II

Skin care Products: Method of preparation, pharmaceutical and Pharmacological evaluation procedures for various formulations like Creams, Lotions, Lipsticks, face packs. Elaborative study of five formulations under each category with regard to their composition and claims for various herbs used in them.

UNIT - III

Hair care Products: Method of preparation, pharmaceutical and Pharmacological evaluation procedures for various formulations like hair dyes, creams, Lotions, Jels, oils and Shampoos. Elaborative study of five formulations under each category with regard to their composition and claims for various herbs used in them.

UNIT - IV

A brief account of following herbals or herb extracts or herbal products of cosmetic importance such as *Acacia concinna* pods, Aloe Vera, Almond oil, Neem, *Citrus aurantium* peels, Henna, Turmeric, Liquorice, Olive oil, tea tree oil and wheat germ oil with special emphasis on their source, active principles and cosmetic properties.

UNIT - V

a) General Principles of Quality control and standardization of cosmetics-Raw material control, Packaging material control, finished product control, Shelf testing.
b) Natural colorants : Biological Source, coloring principles, chemical nature and usage of the following Annato, Cochineal, Caramel, Henna, Indigo, Madder, Saffron , Turmeric
c) Flavors and Perfumes : Sandal wood oil, Orange oil, Lemon oil, Vanilla, Palmarosa, geranium oil

REFERENCES:

1. Cosmetics- Formulation, Manufacturing and Quality control –P.P. Sharma
2. Herbal Cosmetics Hand Book- H. Panda
3. Herbal Cosmetics by P. K Chattopadhyay
4. The Complete Technology Book on Herbal Perfumes and Cosmetics by H. Panda

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I Year – I Sem M. Pharm (PAQA / QA)

PHARMACEUTICAL FORMULATION TECHNOLOGY (Open Elective – I)

Course Objectives: Students will know the preformulation studies, methodology, different excipients used in solid dosage forms and their evaluation with references to production technologies. The students also know the optimization techniques and their applications in pharmaceutical industries.

Course Outcome: Students shall explain the preformulation parameters, apply ICH guidelines and evaluate drug, drug excipients compatibility. Students also explain about formulation and development, use of excipients in tablets, powders, capsules, micro-encapsules and coating techniques. They also learn and apply the statistical design in different formulations.

Unit - I:

Preformulation: Goals of preformulation, solid state manipulation and characterization. pH dependent solubility of drug, equilibrium solubility, intrinsic dissolution of drug, particle size distribution.

Flow of Powders: Physical properties and importance. Angle of repose, Cars index, compressibility, bulk density, tapped density.

Unit - II:

Excipients used in various dosage forms like tablets, capsules, emulsions, suspensions, semisolids and sterile products. Knowledge of packing materials. Drug- excipient compatibility- Drug stability, factors affecting stability, stabilization methods.

Unit - III:

Tablets: Types of tablets, granulation methods, highlighting operations such as mixing, drying, milling, blending, lubrication and compression.

Tablet coating: Types of coating, steps involved in coating process- pan coating and fluid bed coating and problems associated with coating.

Hard Gelatin Capsules: General principles and steps involved in the production of drug loaded hard gelatin capsules, filling operation, filling of powders, granules and pellets.

Unit - IV:

Dissolution: Principles of dissolution, factors influencing dissolution, official methods and apparatus. Dissolution of immediate release, controlled release and delayed release products.

Unit - V:

Stability testing: Chemical degradation and preventive measures. Various stability testing conditions and use of stabilizers in packing

TEXT BOOKS:

1. Pharmaceutics - The Science of Dosage form design by ME Aulton.
2. Pharmaceutical Dosage forms - Tablets (Vol I, II and III) by Lieberman, Lachman and Schwartz.
3. Pharmaceutical Dosage forms - Capsules (Vol I, II and III) by Avis, Lieberman and Lachman.
4. Pharmaceutical Dosage forms – Disperse systems (Vol I, II and III) by Avis, Lieberman and Lachman.
5. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.
6. Pharmaceutical statistics by Bolton

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7. Industrial Pharmacy - Selected Topics , CVS Subramanyam and J Thimmasetty, Vallabha Prakashan Delhi - 2013

REFERENCE BOOKS:

1. The Theory and Practice of industrial Pharmacy by Leon Lachman, Herbert A. Lieberman.
2. Remington's Science and Practice of Pharmacy by A. Gennaro.
3. Ansel's Pharmaceutical Dosage form and Drug delivery system by Loyd V. Allen, Jr. Nicholas G. Popovich, Howard C. Ansel.
4. Generic Drug Product Development by Leon Shargel and Isadore Kanfer.
5. Dispensing for Pharmaceutical Students by SJ Carter.

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I Year – I Sem M. Pharm (PAQA / QA)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES LAB

List of experiments:

1. Colorimetry / UV / Visible, Spectroscopy, scanning of few compounds for UV-absorption, calculation of Assay / content uniformity / % of drug release (2-3 experiments.)
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiment base on HPLC (Isocratic and gradient) Techniques – (2 experiments)
4. Incompatibility studies, identification and functional groups – Determination by FTIR (2 experiments)
5. Separation and calculation of Rf values by using paper chromatography, TLC, HPTLC Technique (2-3 experiments)
6. Calibration of glasswares
7. Calibration of pH meter
8. Calibration of UV-Visible spectrophotometer
9. Calibration of FTIR spectrophotometer
10. Calibration of HPLC instrument

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I Year – I Sem M. Pharm (PAQA / QA)

ADVANCED PHARMACEUTICAL ANALYSIS LAB

List of experiments

1. Determination of official compounds by Non-aqueous titrations
2. Determination of drugs containing di and trivalent metal ions by complexometric titrations
3. Determination of sulfa drugs by diazotization
4. Determination of Vitamin C by redox titration
5. Quantitative determination of hydroxyl group.
6. Quantitative determination of amino group
7. Colorimetric determination of drugs by using different reagents
8. Quantitative determination of pharmaceutical dosage forms belonging to alkaloids, antibiotics, vitamins, glycosides and steroids

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.PHARMACY (PHARMACOLOGY)

COURSE STRUCTURE AND SYLLABUS
Effective from Academic Year 2019-20 Admitted Batch

I YEAR I Semester

Course Code	Course Title	L	T	P	Credits
Professional Core-I	Advanced Pharmacology – I	3	0	0	3
Professional Core-II	Clinical Pharmacology and Pharmacotherapeutics	3	0	0	3
Professional Elective-I	1. Pharmacokinetics and Drug Metabolism 2. Clinical Research and Pharmacovigilance 3. Principles of Drug Discovery	3	0	0	3
Professional Elective-II	1. Animal cell cultures and applications 2. Molecular Biology 3. Principles of Toxicology	3	0	0	3
MC	Research Methodology and IPR	2	0	0	2
Laboratory-I	Advanced Pharmacology - I Lab	0	0	4	2
Laboratory-II	Clinical Pharmacology and Pharmacotherapeutics Lab	0	0	4	2
Audit	Audit Course - I	2	0	0	0
	TOTAL	**16**	**0**	**8**	**18**

I YEAR II Semester

Course Code	Course Title	L	T	P	Credits
Professional Core-III	Advanced Pharmacology- II	3	0	0	3
Professional Core-IV	Pharmacological Screening Methods and Toxicology	3	0	0	3
Professional Elective-III	1. Quality Use of Medicines 2. Pharmacoepidemiology and Pharmacoeconomics 3. Advanced Drug Delivery Systems	3	0	0	3
Professional Elective-IV	1. Pharmaceutical Management 2. Nutraceuticals 3. Pharmacokinetic and therapeutic drug monitoring	3	0	0	3
Laboratory-III	Advanced Pharmacology – II Lab	0	0	4	2
Laboratory-IV	Pharmacological Screening Methods and Toxicology lab	0	0	4	2
--	Mini project with seminar	2	0	0	2
Audit	Audit Course – II	2	0	0	0
	TOTAL	**16**	**0**	**8**	**18**

Audit Courses 1 & 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technological Learning
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmacology)

ADVANCED PHARMACOLOGY- I (Professional Core-I)

Course Objective: The subject is designed to strengthen the basic knowledge in the field of pharmacology and toimpart recent advances in the drugs used for the treatment of various diseases. In addition, this subject helps the students to understand the concepts of drug action and mechanisms involved.

Course Outcome: Upon completion of the course the student shall be able to:

- Discuss the pathophysiology and pharmacotherapy of certain diseases
- Explain the mechanism of drug actions at cellular and molecular level
- Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases

UNIT - I

General Pharmacology:

a. Pharmacokinetics: The dynamics of drug absorption, distribution, biotransformation and elimination. Concepts of linear and non-linear compartment models. Significance of Protein binding.

b. Pharmacodynamics: Mechanism of drug action and the relationship between drug concentration and effect. Receptors, structural and functional families of receptors quantitation of drug receptors interaction and elicited effects.

UNIT-II

Neurotransmission

a. General aspects and steps involved in neurotransmission.

b. Neurohumoral transmission in autonomic nervous system (Detailed study about neurotransmitters- Adrenaline and Acetylcholine).

c. Neurohumoral transmission in central nervous system (Detailed study about neurotransmitters- histamine, serotonin, dopamine, GABA, glutamate and glycine].

d. Non-adrenergic non-cholinergic transmission (NANC). Cotransmission

Systemic Pharmacology A detailed study on pathophysiology of diseases, mechanism of action, pharmacology and toxicology of existing as well as novel drugs used in the following systems Autonomic Pharmacology Parasympathomimetics and lytics, sympathomimetics and lytics, agents affecting neuromuscular junction

UNIT-III

Central nervous system Pharmacology

General and local anesthetics Sedatives and hypnotics, drugs used to treat anxiety. Depression, psychosis, mania, epilepsy, neurodegenerative diseases. Narcotic and non-narcotic analgesics.

UNIT-IV

Cardiovascular Pharmacology

Diuretics, antihypertensives, antiischemics, anti- arrhythmics, drugs for heart failure and hyperlipidemia. Hematinics, coagulants, anticoagulants, fibrinolytics and antiplatelet drugs.

UNIT-V

Autacoid Pharmacology

The physiological and pathological role of Histamine, Serotonin, Kinins Prostaglandins Opioid autacoids. Pharmacology of antihistamines, 5HT antagonists.

REFERENCES:

1. The Pharmacological Basis of Therapeutics, Goodman and Gillman's
2. Principles of Pharmacology. The Pathophysiologic basis of drug Therapyby David E Golan, Armen H, Tashjian Jr, EhrinJ, Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkins Publishers.
3. Basic and Clinical Pharmacology by B. G Katzung
4. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B. C. Yu.
6. Graham Smith. Oxford textbook of Clinical Pharmacology.
7. Avery Drug Treatment
8. Dipiro Pharmacology, Pathophysiological approach.
9. Green Pathophysiology for Pharmacists.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmacology)

CLINICAL PHARMACOLOGY AND PHARMACOTHERAPEUTICS (Professional Core - II)

Course Objective
This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.

Course Outcome: At completion of this subject it is expected that students will be able to understand **–**

- the pathophysiology of selected disease states and the rationale for drug therapy;
- the controversies in drug therapy;
- the importance of preparation of individualised therapeutic plans based on diagnosis;
- needs to identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects);
- summarize the therapeutic approach to management of these diseases including reference to the latest available evidence;
- Therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).
- Pathophysiology and applied Pharmacotherapeutics of diseases associated with following system/diseases with of special reference to the drug of choice.

UNIT - I
Principles of Pharacokinetics

1. Revision of basic concepts.
2. Clinical Pharmacokinetics.
    a. Dose – response in man
    b. Influence of renal and hepatic disease on Pharmacokinetics
    c. Therapeutics drug monitoring & individualization of drug therapy
    d. Population Pharmacokinetics.

UNIT - II
Adverse Drug Reactions, Drug Interactions, ADR monitoring & Pharmacovigilance.

UNIT - III
Pathophysiology and drug therapy of the following disorders.
Schizophrenia, anxiety, depression, epilepsy, Parkinson's, alzheimer's diseases, migraine, hypertension, angina pectoris, arrhythmias, atherosclerosis, myocardial infaraction.

UNIT - IV
Pathophysiology and drug therapy of the following disorders.
TB, leprosy, leukemia, solid tumors, lymphomas, psoriasis, respiratory, urinary, g.i. tract infections, endocarditis, fungal and HIV infection, rheumatoid arthritis, glaucoma, menstrual disorders, menopause.

UNIT - V

Drug therapy in

a) Geriatrics
b) Pediatrics
c) Pregnancy & Lactation.
d) Renal & hepatic insufficiency

REFERENCES:

1. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication.
2. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange.
3. Pathologic basis of disease - Robins SL, W.B. Saunders publication.
4. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication.
5. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication.
6. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
7. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.
8. Relevant review articles from recent medical and pharmaceutical literature.
9. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange
10. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication
11. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmacology)

PHARMACOKIENTICS AND DRUG METABOLISM (Professional Elective - I)

Course Objective: In current methods of treatment which involves individualization of drug therapy, the student should have sound knowledge in pharmacokinetics and the effects of changes in pharmacokinetic parameters on therapeutic efficacy of the drugs.

Course Outcomes: Upon completion of the subject student shall be able to (Know, do, appreciate);

- Understand various pharmacokinetic parameters
- Influence of these parameters on efficacy of drugs
- Identify and resolve drug related problems;
- Pharmacogenetics

UNIT - I
Drug Absorption: Gastrointestinal, percutaneous, and rectal kinetics and factors affecting drug absorption. Absorption kinetics

UNIT - II
Drug Distribution: Plasma protein binding – factors affecting plasma protein binding – Tissue binding – transfer of drugs through biological barriers their therapeutic implication in drug action. Volume of distribution. Reaction of the body to foreign substances: Biotransformation of drugs, phase I and phase II metabolic reactions.

UNIT - III
Elimination of drugs: Concept of renal clearance and excretion of drugs –biological half – life, area under curve.

UNIT - IV
Bioavailability of drug products: Bioavailability tests. Bioequivalence. Compartment models and relevant pharmacokinetic parameters.

UNIT - V
Pharmacogenetics: Inter racial and individual variability in drug metabolism.

REFERENCES:

1. Shargel and Leon. Applied Biopharmaceutics and pharmacokinetics. Latest edition. Publisher: Prentice Hall, London.
2. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi b. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvnia.
3. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.
4. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
5. Biopharmaceutics and Pharmacokinetics; By Robert F Notari f. Biopharmaceutics; By Swarbrick
6. Biopharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B. Jaiswal, Vallabh Prakashan Pitampura, Delhi
7. Cilincal Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and Thomas, N. Tozer, Lea and Febrger, Philadelphia, 1995.

8. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
9. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Robert F Notari Marcel Dekker Inn, New York and Basel, 1987.
10. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James, Roylan, Marcel Dekker Inc, New York 1996.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmacology)

CLINICAL RESEARCH AND PHARMACOVIGILANCE (Professional Elective - I)

Course Objective: This subject will provide a value addition and current requirement for the students in clinical research and pharmacovigilance. It will teach the students on conceptualizing, designing, conducting, managing and reporting of clinical trials. This subject also focuses on global scenario of pharmacovigilance in different methods that can be used to generate safety data. It will teach the students in developing drug safety data in pre-clinical, clinical phases of drug development and post market surveillance.

Course Outcomes: Upon completion of the course, the student shall be able to,

- Explain the regulatory requirements for conducting clinical trial
- Demonstrate the types of clinical trial designs
- Explain the responsibilities of key players involved in clinical trials
- Execute safety monitoring, reporting and close-out activities
- Explain the principles of Pharmacovigilance
- Detect new adverse drug reactions and their assessment
- Perform the adverse drug reaction reporting systems and communication in pharmacovigilance

UNIT- I

Regulatory Perspectives of Clinical Trials: Origin and Principles of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines Ethical Committee: Institutional Review Board, Ethical Guidelines for Biomedical Research and Human Participant-Schedule Y, ICMR, Informed Consent Process: Structure and content of an Informed Consent Process Ethical principles governing informed consent process

UNIT - II

Clinical Trials: Types and Design: Experimental Study- RCT and Non RCT, Observation Study: Cohort, Case Control, Cross sectional Clinical Trial Study Team Roles and responsibilities of Clinical Trial Personnel: Investigator, Study Coordinator, Sponsor, Contract Research Organization and its management.

UNIT- III

Clinical Trial Documentation: Guidelines to the preparation of documents, Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study Report Clinical Trial Monitoring-Safety Monitoring in CT Adverse Drug Reactions: Definition and types. Detection and reporting methods. Severity and seriousness assessment. predictability and preventability assessment. Management of adverse drug reactions; Terminologies of ADR.

UNIT- IV

Basic aspects, terminologies and establishment of pharmacovigilance: History and progress of pharmacovigilance, Significance of safety monitoring, Pharmacovigilance in India and international aspects, WHO international drug monitoring programme, WHO and Regulatory terminologies of ADR, evaluation of medication safety, Establishing pharmacovigilance centres in Hospitals, Industry and National programmes related to pharmacovigilance. Roles and responsibilities in Pharmacovigilance.

UNIT- V

Methods, ADR reporting and tools used in pharmacovigilance: International classification of

diseases, International Nonproprietary names for drugs, Passive and Active surveillance, Comparative observational studies, targeted clinical investigations and Vaccine safety surveillance. Spontaneous reporting system and Reporting to regulatory authorities, Guidelines for ADRs reporting. Argus, Aris G Pharmacovigilance, Vigi Flow, Statistical methods for evaluating medication safety data.

REFERENCES:

1. Central Drugs Standard Control Organization- Good Clinical Practices, Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
2. International Conference on Harmonization of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonized Tripartite Guideline. Guideline for Good Clinical Practice. E6; May 1996.230
3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
5. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
6. Handbook of clinical Research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone.
7. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
8. Textbook of Pharmacovigilance: Concept and Practice. G. P. Mohanta and P. K. Manna. 2016, Pharma Med Press.
9. A textbook of Clinical Pharmacy Practice: Essential Concepts and Skills. Second Edition, 2012, University Press

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmacology)

PRINCIPLES OF DRUG DISCOVERY (Professional Elective - I)

Course Objective: The subject imparts basic knowledge of drug discovery process. This information will make the student Competent in drug discovery process.

Course Outcome: Upon completion of the course, the student shall be able to,

- Explain the various stages of drug discovery.
- Appreciate the importance of the role of genomics, proteomics and bioinformatics in drug discovery
- Explain various targets for drug discovery.
- Explain various lead seeking method and lead optimization
- Appreciate the importance of the role of computer aided drug design in drug discovery

UNIT- I

An overview of modern drug discovery process: Target identification, target validation, lead identification, and lead Optimization. Economics of drug discovery. Target Discovery and validation-Role of Genomics, Proteomics and Bioinformatics. Role of Nucleic acid microarrays, Protein microarrays, Antisense technologies, siRNAs, antisense oligonucleotides, Zinc finger proteins. Role of transgenic animals in target validation.

UNIT- II

Lead Identification: combinatorial chemistry & high throughput screening, in silico lead discovery techniques; Assay development for hit identification. Protein structure Levels of protein structure, Domains, motifs, and folds in protein structure. Computational prediction of protein structure: Threading and homology modeling methods. Application of NMR and X-ray crystallography in protein structure prediction.

UNIT-III

Rational Drug Design: Traditional vs rational drug design, Methods followed in traditional drug design, High throughput screening, Concepts of Rational Drug Design, Rational Drug Design Methods: Structure and Pharmacophore based approaches. Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening,

UNIT-IV

Molecular docking: Rigid docking, flexible docking, manual docking; Docking based screening. De novo drug design. Quantitative analysis of Structure Activity Relationship History and development of QSAR, SAR versus QSAR, Physicochemical parameters, Hansch analysis, Fee Wilson analysis, and relationship between them.

UNIT-V

QSAR Statistical methods: regression analysis, partial least square analysis (PLS) and other multivariate statistical methods. 3D-QSAR approaches like COMFA and COMSIA Prodrug design-Basic concept, Prodrugs to improve patient acceptability, Drug solubility, Drug absorption, and distribution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design.

REFERENCES

1. Mouldy Sioud. Target Discovery and Validation Reviews and Protocols: Volume 2 Emerging Molecular Targets and Treatment Options. 2007 Humana Press Inc.
2. Darryl León. Scott MarkelIn. Silico Technologies in Drug Target Identification and Validation 2006 by Taylor and Francis Group, LLC.
3. Johanna K. DiStefano. Disease Gene Identification. Methods and Protocols. Springer New York Dordrecht Heidelberg London.
4. Hugo Kubiny. QSAR: Hansch Analysis and Related Approaches. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
5. Klaus Gubernator, Hans-Joachim Böhm. Structure-Based Ligand Design.
6. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
7. Abby L .Parrill. M. Rami Reddy. Rational Drug Design. Novel Methodology and Practical Applications. ACS Symposium Series; American Chemical Society: Washington, DC, 1999.
8. J. Rick Turner. New drug development design, methodology and, analysis. John Wiley & Sons, Inc., New Jersey.

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M.Pharm I Year I Sem (Pharmacology)

ANIMAL CELL CULTURE (Professional Elective - II)

Course Objective: The subject imparts basic knowledge of animal cell culture. This information will make the student Competent in various cell culture techniques and their applications.

Course Outcome: Upon completion of the course, the student shall be able to,

- Explain the various types of cell cultures, their requirements and advantages
- Appreciate the importance of the bioreactor, cell lines and their applications
- Explain various culture, preservation and maintenance techniques
- Explain various IVF techniques, embryo cultures and gene transfer
- Appreciate the importance of the role embryo culture in and its applications

UNIT - I

Introduction to Animal Biotechnology and its applications: History and scope of animal cell and tissue culture, Advantages and disadvantages of tissue culture, Laboratory facilities for tissue culture. Primary and secondary cell lines cell culture environment, Safety measures laminar hood,

UNIT - II

Basic tissue culture techniques, various types of cultures, Bioreactors, Common cell lines and aseptic methods, Culture media, maintenance and preservation of cell cultures, freezing media, treatment of substrate surfaces.

UNIT - III

Feeder layers on substrate, gas phase for tissue culture, Culture media for cells and tissues, Culture procedures, Disaggregation (enzymatic and mechanical) of tissue and primary culture

UNIT - IV

Cultured cells and evolution of cell lines, Maintenance of culture-cell lines, Tissue culture (slide, flask and test tube cultures), Organ culture, Whole embryo culture, Tissue engineering (artificial skin and artificial cartilage). Cell cultures as a source of valuable products

UNIT - V

In Vitro Fertilization & Transgenic Animals In vitro fertilization (IVF) in humans; embryo transfer (ET) in humans; superovulation, IVF and embryo culture in farm animals (e.g. cow); embryo transfer in cattle, Gene transfer or transfection (using eggs and cultured stem cells); targeted gene transfer; transgenic animals. (mice, sheep, pigs, rabbits, goats, cows, fish).

REFERENCE BOOKS:

1. Introduction to Biotechnology, P.K.Gupta, Kalyani Publishers,second edition.
2. Introduction to plant Biotechnology, H.S.Chawala, second ed., PHI
3. Plant Biotechnology – P. C. Trivedi
4. Applied Plant Biotechnology – Ignacimuthu
5. Animal Biotechnology – Babinnk and Philips.
6. Biotechnology – B. D. Singh.
7. Plant Tissue Culture – S.S. Bhojwani, M.K. Razdan.
8. Biotechnology Fundamentals and Applications – Purohis S S
9. Biotechnology in the Welfare of Mankind – Ali Khan

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M.Pharm I Year I Sem (Pharmacology)

MOLECULAR BIOLOGY (Professional Elective - II)

Course Objective: The subject imparts basic knowledge of molecular biology. This information will make the student Competent in molecular biology DNA topology, mutations and Transcriptions and Translations and Gene expressions.

Course Outcome: Upon completion of the course, the student shall be able to,

- Explain the various structure and chemistry of DNA, RNA etc.
- Explain topology of DNA, organization of DNA in chromosomes
- Appreciate the importance and mechanism of mutations and their repar.
- Explain various mechanism of DNA replications and Transcription
- Appreciate the importance of gene expression.

UNIT - I
Introduction to Molecular biology
Nucleic acids - DNA and RNA structure and functions, DNA as genetic material. Griffth, Avery-McCarty-MCLeod, Hershy- Chase, Franklin Conrat Experiments
DNA Structure: Chemistry of DNA, Forces stabilizing DNA structure, Helix parameters, Forms of DNA (A,B,C,D,T and Z), Watson – Crick and Hoogsteen base pairing , Physical Properties of ds DNA (UV absorption spectra Denaturation and renaturation), Chemical that react with DNA.

UNIT - II
DNA topology: DNA supercoiling, Supercoiled form of DNA, Superhelical density, Energetic of supercoiled DNA, Biology of supercoiled DNA (Topological domain of DNA, DNA topoisomerases, Mechanisms of supercoiling in cells, mechanisms of action of topoisomerase I and II, effect of supercoiling on structure of DNA and role of supercoiling in gene expression and DNA replication).
Organization of DNA into chromosomes: Packaging of DNA and organization of chromosome in bacteria and eukaryotic cells; packaging of DNA in eukaryotic nucleosome and chromatin condensation assembly of nucleosomes upon replication. Chromatin modification and genome expression.

UNIT - III
Mutations- molecular mechanism - types of DNA mutations and its significance. DNA repair - repair mechanisms - need of DNA repairs, DNA recombination – molecular mechanism of recombination-relationship between repair and recombination, SOS mechanism. Proteins and enzymes involved DNA repair and recombination.
DNA – Protein Interactions: General features interaction of Helix- turn Helix motif, B sheet, Zn-DNA binding domain etc with DNA.

UNIT - IV
DNA Replication: Mechanism of DNA polymerase catalyzed synthesis of DNA, types of DNA polymerases in bacteria and their role. Initiation of chromosomal DNA replication and its regulation in prokaryotes assembly of replisome and progress of replication fork, termination of replication. Types and function of eukaryotic DNA polymerases initiation of replication in eukaryotes, role of telomerases in replication of eukaryotic chromosomes. Inhibitor of DNA replication (Blocking precursor synthesis nucleotide polymerization, altering DNA structure).
Transcription: RNA polymerases, features of prokaryotic and eukaryotic promoters. Strong and weak promoters. Assembly of transcription initiation complex in prokaryotes and eukaryotes and its

regulation; synthesis and processing of prokaryotic and eukaryotic transcripts. Transport of RNA within eukaryotic cell. Regulatory elements of genes-promoters. Fate of mRNA.

UNIT 5

Translation- Synthesis and Processing of Proteome: Structure and role of tRNA in protein synthesis, ribosome structure, basic feature of genetic code and its deciphering, translation (initiation, elongation and termination in detail in prokaryotes as well as eukaryotes), Post translational processing of protein (protein folding, processing by proteolytic cleavage, processing by chemical modification, inteins). Protein degradation.

Regulation of Gene expression in prokaryotes and eukaryotes: Positive and negative regulation. lac-, ara-, his- and trp- operon regulation; antitermination, global regulatory responses; Regulation of gene expression in eukaryotes: Transcriptional, translational and processing level control mechanisms.

DNA- transposable elements- types of transposable elements, its importance in variation and evolution. Possible origin of virus, Oncogenes.

REFERENCES:

1. Cell & Molecular Biology: Cell and Molecular Biology: Concepts and Experiments, Gerald Karp, John Wiley, NY
2. Molecular Cell Biology, H.S. Bramrah, Anmol Publications Pvt. Ltd., New Delhi
3. Advanced Molecular Biology, H.S. Bhamrah Viva Books, Pvt. Ltd., New Delhi
4. Plant Biochemistry and Molecular Biology, Hans Walter Held, Oxford, NY
5. Molecular Biology of the Gene, Watson, Baker, Bell, Gann Levine, Losick, Pearson Education Pvt. Ltd., New Delhi
6. Essential Molecular Biology: A Practical Approach, TA Brown, Oxford

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmacology)

PRINCIPLES OF TOXICOLOGY (Professional Elective - II)

Course Objective: The subject imparts basic knowledge of toxicology. This information will make the student Competent in various toxicologies of liver, neuro, kidney etc

Course Outcome: Upon completion of the course, the student shall be able to,

- Explain the various toxicologies
- Explain various toxicologies of lungs, liver, gentic etc
- Appreciate the importance and mechanism of skin and reproductive toxicology
- Explain various mechanisms and affects of pesticides

UNIT - I - Introduction to General Toxicology:
History of toxicology, classification of toxicology, toxicants exposure, routes exposure and exposure characterization. animal and plant toxins, mechanisms of toxicity, toxicokinetics, biotransformation of xenobiotics.

UNIT - II
Toxicology of the liver, Toxicology of the Lung, Chemical Carcinogenesis & Genetic Toxicology

UNIT - III
Neurotoxicology, Cardiovascular Toxicology, Molecular Toxicology & Toxicogenomics, Immuno-toxicology, Toxicology of the Kidney

UNIT - IV
Toxicology of the Intestine, Toxicology of the Skin, Reproductive Toxicology & Teratology, Risk Assessment

UNIT - V
Nanotoxicology, Ecotoxicology, Toxicology of Metals, Analytical/Forensic Toxicology, Toxic Effects of Pesticides, Pesticide Regulation at EPA

REFERENCE BOOKS:

1. Casarett & Doull's Essentials of Toxicology by Curtis D. Klaassen, John B. Watkins
2. Principles of Toxicology by Karen Stine, Thomas M. Brown
3. Text Book of Pathology by Harsh Mohan

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M.Pharm I Year I Sem (Pharmacology)

RESEARCH METHODOLOGY AND IPR

Course Objectives:

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

Course Outcomes: At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT - I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT - II

Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT - III

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT - IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-V:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science &engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

REFERENCES:

1. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
2. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
3. Mayall, “Industrial Design”, McGraw Hill, 1992.
4. Niebel, “Product Design”, McGraw Hill, 1974.
5. Asimov, “Introduction to Design”, Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”, 2016.
7. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

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ADVANDED PHARMACOLOGY – I LAB (Lab – I)

List of experiments

Handling of laboratory animals.

1. Various routes of drug administration.
2. Study of techniques of blood sampling, anesthesia and euthanasia of experimental animals.
3. To record the dose response curve of Ach using isolated ileum/rectus abdominis muscle preparation.
4. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by interpolation method.
5. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by three point method.
6. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by four point method.
7. Estimation of pA2 value on isolated tissues
8. Bioassay of 5-HT using rat fundus strip
9. Bioassay of oxytocin using rat uterus

REFERENCES:

1. CPCSEA, OECD, ICH, USFDA, Schedule Y, EPA guidelines,
2. Fundamentals of experimental Pharmacology by M. N. Ghosh
3. Handbook of Experimental Pharmacology by S.K. Kulkarni.
4. Drug discovery and Evaluation by Vogel H.G.
5. Practical Manual of Experimental and Clinical Pharmacology by Bikash Medhi (Author), Ajay Prakash (Author) Jaypee brothers' medical publishers Pvt. Ltd

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmacology)

CLINICAL PHARMACOLOGY AND PHARMACOTHERAPEUTICS LAB (Lab – II)

The students are required to be collect Prescriptions and of clinical details of different patients for their exposure with therapeutic management and other clinical aspects. They are expected to have experience and do a case presentation in the following clinical conditions. The students have to make at least 5 case presentations covering most common diseases. The student should also submit a record of the cases presented. The list of clinical cases presented should include follow-up of the clinical cases mentioned below from the day of admission till discharge and presented in the SOAP (Subjective, Objective, Assessment and Plan) format.

I. The cases may be selected from the following diseases:
   1. Neurology& Psychiatry
   2. Oncology
   3. Infectious Diseases & Immunology
   4. Gynecologic & Obstetric Disorders/ Ophthalmology
   5. Cardiology
   6. Dermatology
   7. Endocrinology

II. Rational use of medicines in special population (three)
III. Calculation of Bioavailability and Bioequivalence from the given data (two)
IV. Interpretation of Therapeutic Drug Monitoring reports of a given patient (three)
V. Calculation of various Pharmacoeconomic outcome analysis for the given data (two)

Assignments
The students are required to submit a minimum of three written assignments (1500 to 2000 words) selected from the topics on different disease conditions given to them. The students are required to discuss both the clinical and therapeutic aspects in the same.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmacology)

ENGLISH FOR RESEARCH PAPER WRITING (Audit Course - I & II)

Prerequisite: None

Course objectives: Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

UNIT-I:
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-II:
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-III:
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV:
key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT-V:
skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

TEXT BOOKS/ REFERENCES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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Kommula Vill, Vijayapuri Colony,
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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmacology)

DISASTER MANAGEMENT (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches,
- planning and programming in different countries, particularly their home country or the countries they work in

UNIT-I:
Introduction:
Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.
Disaster Prone Areas in India:
Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-II:
Repercussions of Disasters and Hazards:
Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III:
Disaster Preparedness and Management:
Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-IV:
Risk Assessment Disaster Risk:
Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT-V:
Disaster Mitigation:
Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

TEXT BOOKS/ REFERENCES:

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “’New Royal book Company.
2. Sahni, Pardeep Et. Al. (Eds.),” Disaster Mitigation Experiences and Reflections”, Prentice Hall of India, New Delhi.
3. Goel S. L., Disaster Administration and Management Text and Case Studies”, Deep &Deep Publication Pvt. Ltd., New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmacology)

SANSKRIT FOR TECHNICAL KNOWLEDGE (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Course Outcomes: Students will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

UNIT-I:
Alphabets in Sanskrit,

UNIT-II:
Past/Present/Future Tense, Simple Sentences

UNIT-III:
Order, Introduction of roots,

UNIT-IV:
Technical information about Sanskrit Literature

UNIT-V:
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TEXT BOOKS/ REFERENCES:

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmacology)

VALUE EDUCATION (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

Course outcomes: Students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality

UNIT-I:
Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

UNIT-II:
Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

UNIT-III:
Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

UNIT-IV:
Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT-V:
Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation, Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

TEXT BOOKS/ REFERENCES:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmacology)

CONSTITUTION OF INDIA (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

UNIT-I:
History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working), **Philosophy of the Indian Constitution:** Preamble**,** Salient Features.

UNIT-II:
Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality**,** Right to Freedom**,** Right against Exploitation**,** Right to Freedom of Religion**,** Cultural and Educational Rights**,** Right to Constitutional Remedies, Directive Principles of State Policy**,** Fundamental Duties.

UNIT-III:
Organs of Governance: Parliament**,** Composition**,** Qualifications and Disqualifications**,** Powers and Functions**,** Executive**,** President**,** Governor**,** Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

UNIT-IV:
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT-V:
Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

TEXT BOOKS/ REFERENCES:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmacology)

PEDAGOGY STUDIES (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Course Outcomes: Students will be able to understand:

- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

UNIT-I:

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

UNIT-II:

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT-III:

Evidence on the effectiveness of pedagogical practices, Methodology for the indepth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the scho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT-IV:

Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT-V:

Research gaps and future directions: Research design**,** Contexts**,** Pedagogy**,** Teacher education**,** Curriculum and assessment**,** Dissemination and research impact.

TEXT BOOKS/ REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.

3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmacology)

STRESS MANAGEMENT BY YOGA (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To achieve overall health of body and mind
- To overcome stress

Course Outcomes: Students will be able to:

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

UNIT-I:
Definitions of Eight parts of yog. (Ashtanga)

UNIT-II:
Yam and Niyam.

UNIT-III:
Do`s and Don't's in life.
i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT-IV:
Asan and Pranayam

UNIT-V:
i) Various yog poses and their benefits for mind & body
ii) Regularization of breathing techniques and its effects-Types of pranayam

TEXT BOOKS/ REFERENCES:

1. 'Yogic Asanas for Group Tarining-Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmacology)

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS
(Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Course Outcomes: Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

UNIT-I:

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

UNIT-II:

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-III:

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT-IV:

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

UNIT-V:

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

TEXT BOOKS/ REFERENCES:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.PHARMACY (PHARMACEUTICAL CHEMISTRY)

R19 COURSE STRUCTURE AND SYLLABUS
Effective from Academic Year 2019-20 Admitted Batch

I YEAR I Semester

Course Code	Course Title	L	T	P	Credits
Professional Core-I	Advanced Organic Chemistry-I	3	0	0	3
Professional Core-II	Advanced Medicinal Chemistry-I	3	0	0	3
Professional Elective-I	1. Chemistry of Natural Products 2. Modern Pharmaceutical Analytical Techniques 3. Drug Regulatory Affairs	3	0	0	3
Professional Elective-II	1. Drug Discovery & Design 2. Pharmaceuticals and Food Analysis 3. Spectral Analysis	3	0	0	3
MC	Research methodology and IPR	2	0	0	2
Laboratory-I	Advanced Organic Chemistry – I Lab	0	0	4	2
Laboratory-II	Advanced Medicinal Chemistry – I Lab	0	0	4	2
Audit	Audit Course – I	2	0	0	0
	TOTAL	**16**	**0**	**8**	**18**

I YEAR II Semester

Course Code	Course Title	L	T	P	Credits
Professional Core-III	Advanced Organic Chemistry –II	3	0	0	3
Professional Core-IV	Advanced Medicinal Chemistry II	3	0	0	3
Professional Elective-III	1. Pharmaceutical Process Chemistry 2. Quality Control and Quality Assurance 3. Clinical Research and Pharmacovigilance	3	0	0	3
Professional Elective-IV	1. Screening Methods in Pharmacology 2. Advanced Instrumental Analysis 3. Herbal Drug Technology	3	0	0	3
Laboratory-III	Advanced Organic Chemistry - II Lab	0	0	4	2
Laboratory-IV	Advanced Medicinal Chemistry - II Lab	0	0	4	2
--	Mini project with seminar	2	0	0	2
Audit	Audit Course - II	2	0	0	0
	TOTAL	**16**	**0**	**8**	**18**

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Audit Courses 1 & 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technological Learning
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Chemistry)

ADVANCED ORGANIC CHEMISTRY – I (Professional Core – I)

Course Objectives: The course structure is designed to give the knowledge of organic chemistry at an advanced level and mainly aimed at the stereochemistry and different organic named reactions including preparations of reactive intermediates.

Course Outcome: The student would be in position to design a stereoselective synthesis of new chemical entities (NCE) for the treatment of different diseases in new drug discovery Program.

UNIT I

a. Stereochemistry: a. Elements of symmetry, simple axis of symmetry. Notation, relative configuration and absolute configuration. Compounds with a chiral carbon atom, compounds with other quadrivalent chiral atoms. Optical isomerism in compounds containing no chiral atom, biphenyl, allenes, compounds with exocylic double bonds and spirans.
b. Chirality due to helical shape.cis / trans, E – Z isomerism resulting from double bonds, monocyclic compounds, fused ring system. Racemic modifications and methods for resolution of racemic mixtures. Asymmetric synthesis and stereo – selective synthesis.

UNIT II

a. Reactive Intermediates**:** Definitions, generation, stability, structure and reactivity of free radicals carbocations, carbanions, carbenes, Nitrenes/Nitrenium ions.
b. Concepts of aromaticity and antiaromaticity, nonbenzenoid aromatic compounds.

UNIT III

Mechanisms of organic reactions: Free radical, Electrophilic, Nucleophilic reactions of aliphatic and aromatic compounds

UNIT IV

Elimination Reactions: E_1, E_2, E_{1CB} and E_{2CB} mechanisms, Mechanisms and orientation in pyrolytic eliminations, effect of substrate structure, attacking base, leaving group and reaction bond, medium and reactivity addition to carbon – carbon multiple bond reactions. Mechanisms, Orientation and reactivity.

UNIT V

Electrocyclic, pericyclic and sigmotropic reactions: Introduction, terminology and mechanism, with suitable examples.

RECOMMENDED BOOKS:

1. Francis A. Carey & Richard J. Sunberg, Advanced Org. Chemistry, III rd Edition, Par B; Reactions and synthesis, Plenum Press, New York, London, Latest Edition.
2. Eliel I. Ernest and Samuel h, Stereochemistry of Org. Compounds, John Wiley and sons, New York, 2003 Edition.
3. Roland E. Lehr & Alan P Marchard, Orbital Symmetry: A Problem-Solving approach, Academic Press, New York Latest Edition.
4. J. March, Advanced Org. Chemistry, Reactions Mechanisms and Structure, 4th
5. Edition, John Wiley & Sons, New York Latest Edition
6. I. L. Finar, Organic Chemistry, ELBS
7. Herbert O. Modern Synthesis Reactions IInd Edition W.A. Beenamis Inc. Menco Park California

8. W. Carruthers, Some Modern Methods of Org. Synthesis, III rd Edition, Cambridge University Press, Cambridge.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Chemistry)

ADVANCED MEDICINAL CHEMISTRY – I (Professional Core – II)

Course Objectives: The course contents are mainly aimed to have advanced knowledge of rational drug design including QSAR and molecular modeling and also aimed at the identification of lead molecule from natural sources for the development of new drugs.

Course Outcome: The student would be in a position to have detailed knowledge of computer aided drug design which is useful to involve in new drug discovery Program by the utilization of natural leads and also with the help of structure-based drug design.

UNIT I

Modern methods of Drug Discovery target validation: Introduction to discovery of lead molecule, methods, rational drug discovery models. Target structure, active site identification and methods of validation.

UNIT II

Rational Drug Design: QSAR: Parameters involved in QSAR, lipophilicity (Polarisabiltiy, electronic and steric parameters). Quantitative models. Hansch Analysis, Free Wilson Analysis and their relationships, linear relationships and applications of Hansch and Free Wilson Analysis.

UNIT III

a. **Computer aided drug design (CADD):**
   Virtual screening: concept, drug likeness screening, focused screening libraries for lead identification, pharmacophore screening, structure based virtual screening and applications.
   Molecular modeling: Molecular mechanics, quantam mechanics, modeling ligands for known receptors and unknown receptors.
b. **Drug Design:** Introduction, Pharmacophase – based drug design, Known receptors, structure – based drug design, homology modeling, unknown receptors.

UNIT IV

Natural Products as Leads for New Drugs: Introduction/History, approaches to discovery and development of natural products as potential new drugs, selection and optimization of lead compounds for further developments from CNS, anticancer antibiotics and cardiovascular drugs.

UNIT V

Structure based drug design: Inhibitors of HIV-I Prokinase, Structural studies of HIV-I Reverse transcriptase and implications for drug design, Bradykinin receptor antagonists, Design of purine nucleoside and Phosphorylase inhibitors, Aldose Reductase Inhibitors, Thrombin inhibitors. Rhinoviral-Capsid-biding Inhibitors.

RECOMMENDED BOOKS:

1. Berger's Medicinal Chemistry and Drug Design. 6th Edition.
2. Korolkovas Essentials of Medicinal Chemistry
3. Purcell Strategies of Drug Design
4. Corwin, Hansen Comprehensive Medicinal Chemistry
5. William O Foye Medicinal Chemistry
6. Structure based Drug Design by Pandi Veerapandion.
7. Stenlake, Foundation of Molecular Pharmacology- Pharma Med Press, volume I &II

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Chemistry)

CHEMISTRY OF NATURAL PRODUCTS (Professional Elective – I)

Course Objective: The contents of Unit I mainly aimed to identify lead molecules from the natural sources. The contents of Unit II &III are mainly designed to have the knowledge of alkaloids and steroids especially structural elucidation of few important compounds. The contents of Unit IV and V are to offer an understanding of utilization of natural products for the preparation of new molecules for the treatment of different diseases like cancer, malaria etc.

Course Outcome: The student would be in a position to explore the natural lead compounds for the treatment of different diseases like cancer, malaria, diabetes etc.

UNIT I
Natural products as leads for new drugs: Introduction/history, approaches to discovery and development of natural products as potential new drugs selection and optimization of lead compounds for further development with suitable examples from antibiotics, CNS, and cardiovascular agents.

UNIT II
Alkaloids: Introduction and general methods of structure elucidation.
From opium: morphine-structure elucidation, development of morphine analogues and morphine antagonists.
From Rauwolfia: Reserpine-structure eludication, structural modifications and uses.
From vinca rosea: vincristine and vinblastine - structural modification, semisynthetic derivatives and uses.

UNIT III
Steroids: Introduction, nomenclature, stereochemistry of steroids. Source and structure elucidation of cholesterol and diosgenin.
Structures, structure modifications and therapeutic uses of steroidal anti-inflammatory agents and antifertility agents.

UNIT IV
Polypeptides and proteins: introduction and general methods of separation, general methods of degradation and end group analysis, general methods of synthesis of peptides. Primary, secondary, tertiary and quaternary structure of proteins; chemistry of insulin.

UNIT V
Compounds of medicinal Interest: Structure, structural modifications, mechanism of action and therapeutic uses of a) taxanes b) camptothecin c) artemisinin e) ginkgolides and f) gymnemic acids.

RECOMMENDED BOOKS:
1. Finar IL. Organic Chemistry-stereochemistry and the chemistry of natural products. 5th ed. vol 2. Delhi: Dorling Kindersley (India) Pvt. Ltd., 2006.
2. Morrison RT, Boyd RN. Organic Chemistry. 6th ed. Delhi: Pearson education Pvt. Ltd., 2003.
3. Pelletier SW. Alkaloids-chemical & biological perspectives. vol 1-15. London: Pergamon; 2001.
4. Steroids by Fischer & Fischer.
5. Evans WC. Trease and evans pharmacognosy. 15th ed. Edinburgh: Saunders. 2004.
6. Ataur Rahman. Chemistry of natural products
7. Bhat SV, Nagasampagi BA, Sivakumar M. Chemistry of natural products. New Delhi: Narosa Publishing House; 2005.

8. Agrawal OP. Organic chemistry-natural products. 30th ed. vol 1-2. Meerut: Goel Publishing House; 2006.
9. Wallis TE. Textbook of pharmacognosy. 5th ed. New Delhi: CBS Publishers & Distributors; 2002.
10. Abraham DJ, editor. Burger's medicinal chemistry and drug discovery. 6th ed. vol 1-6, Singapore: John Wiley & Sons, 2007.
11. Lemke TL, Williams DA, Roche VF, Zito SW. Foye's principles of medicinal chemistry. 6th ed. New Delhi: Wolters Kluwer/ Lippincott Williams & Wilkins. 2008.
12. Block JH, Beale JM, editor. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry. 11th ed. Baltimore: Lippincott Williams & Wilkins; 2004.
13. Jerry M. Advanced organic chemistry-reactions, mechanisms, and structure. 4th ed. Kundli: Replika Press Pvt. Ltd; 2003.
14. Murray RK, Granner DK, Mayes PA, Rodwell VW. Harper's Illustrated biochemistry. 26th ed. New Delhi: Mc Graw Hill, 2003.
15. Rama Rao AVSS. A text book of biochemistry. 9th ed. Delhi: Rajkamal electric press, 2004.
16. Remington: The science and practice of pharmacy. 21st ed., vol. I & II, Lippincatt Willams & Wilkings, New Delhi, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Chemistry)
MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (Professional Elective – I)

Course Objective: The course is designed to impart the knowledge in the field of Pharmaceutical Analysis. The various modern analytical techniques like UV-Visible, IR, NMR, Mass, GC, HPLC, different chromatographic methods and other important topics are taught to enable the students to understand and apply the principles involved in the determination of different bulk drugs and their formulation. In addition to the theoretical aspects, the basic practical knowledge relevant to the analysis is also imparted.

Course Outcome: The appreciable knowledge will be gained by the students in the Modern Analytical Techniques and can apply the theories in the Analysis of various bulk drugs and their formulations. The students will also be in a position to apply their knowledge in developing the new methods for the determination and validate the procedures.

UNIT I

Introduction to chromatography and classification of chromatographic methods based on the mechanism of separation

a. Column Chromatography: Adsorption and partition, theory, preparation, procedure and methods of detection
b. Thin Layer Chromatography: Theory, preparation, procedures, detection of compounds
c. Paper Chromatography: Theory, different techniques employed, filter papers used, qualitative and quantitative detection
d. Counter – current extraction, solid phase extraction techniques, gel filtration

UNIT II

a. Gas chromatography: Introduction, fundamentals, instrumentation, columns: preparation and operation, detection, dramatization.
b. HPLC: Principles and instrumentation, solvents and columns used, detection and applications
c. HPTLC: Theory and principle, instrumentation, elution techniques and pharmaceutical applications

UNIT III

a. UV-Visible spectroscopy: Introduction, electromagnetic spectrum, absorbance laws and limitations, instrumentation-design and working principle, chromophore concept, auxochromes, Wood-Fisher rules for calculating absorption maximum, applications of UV-Visible spectroscopy
b. IR spectroscopy: Basic principles - Molecular vibrations, vibrational frequency, factors influencing vibrational frequencies, sampling techniques, instrumentation, interpretation of spectra, FT-IR, theory and applications

UNIT IV

Mass spectroscopy: Theory, ionization techniques: electron impact ionization, chemical ionization, field ionization, fast atom bombardment, plasma desorption, fragmentation process: types of fission, resolution, GC/MS, interpretation of spectra and applications for identification and structure determination.

UNIT V

NMR: Theory, instrumentation, chemical shift, shielding and deshielding effects, splitting of signals, spin-spin coupling, proton exchange reactions, coupling constant(J), nuclear overhauser effect (NOE), ^{13}CNMR spectra and its applications, 2D-NMR, COSY and applications in pharmacy.

REFERENCES:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. A Text book of Pharmaceutical Analysis by Kerrenth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein
11. HPTLC by P.D. Seth
12. Indian Pharmacopoeia 2007
13. High Performance thin layer chromatography for the analysis of medicinal plants by Eike Reich, Anne Schibli
14. Introduction to instrumental analysis by Robert. D. Braun

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Chemistry)

DRUG REGULATORY AFFAIRS (Professional Elective – I)

Course Objective: The topics which are present in the Drug regulatory affairs are very much useful which increases the knowledge regarding the regulatory aspects in the pharmaceutical industries.

Course Outcome:

- Students will come to know the different competent regulatory authorities globally.
- Students be aware of technical aspects pertaining to the marketing authorization application (MAA)
- The regulatory guidelines and directions framed by the regulatory authorities will be helpful to place the drug products in market for marketing approvals.

UNIT I

Drug Regulatory Aspects (India)

1. Indian drug regulatory authorities, Central and State regulatory bodies (FDA)
2. Drugs and Cosmmetics Act and Rules with latest Amendments (Selective)
3. Special emphasis – Schedule M and Y
4. New drugs – Importation, Registration, development, Clinical Trials, BE NOC & BE studies
5. Various Licences – Test Lic., Import lic., for testing of drugs and API's, Manufacturing Contract and Loan licence manufacturing.

UNIT II

Good Manufacturing Practices (GMP)

1. Indian GMP certification, WHO GMP certification.
2. ICH guidelines for stability testing and other relevant ones (Q1-Q10)
3. Export permissions and manufacturing for semi-regulated countries
4. Understanding of the plant layouts with special emphasis on the environment & safety (HVAC, Water Systems, Stores Management, Effluent etc.)
5. Quality Assurance and Qulaity Control – Basic understanding for in-built quality.

UNIT III

A detailed study of regulatory aspects that affect drug product design, manufacture and distribution in a developed country such as USA and in a developing country such as Brazil, Hatch Waxmann Act; Bolar Provisions and other FDA Regulations. Regulatory aspects of pharmaceutical and bulk drug manufacture, regulatory drug analysis.

UNIT IV

Documentation related to manufacturing, cleaning methods, retention samples and records, quality control, batch release documents, distribution records, complaints and recalls.
Quality, safety and legislation for cosmetic products and herbal products.

UNIT V

Governing Regulatory Bodies across the globe.

Country Authority Submission

a. U.S Food & Drug Administration USDMF
b. Canada Therapeutic Product Directorate DMF
c. Europe
   1) European Medicines Agency (EMEA/ National Authorities) EDMF
   2) European Directorate for Quality of Medicines CEP/COS & Health Care Products.

3) MHRA – Medicines and Health Care Products Regulatory Agency

d. Product Filing
e. Responding Regulatory Deficiencies
f. Final Approval Procedure

Preparation, review and submission of Drug Master Files to Regulatory Authorities as per their specific requirements.

TEXT AND REFERENCE BOOKS:

1. Original laws published by Govt. of India.
2. Text Book of Forensic Pharmacy by Mithal B. M.; Vallabh Prakashan, New Delhi.
3. Laws of Drugs in India by Hussain.
4. Text Book of Forensic Pharmacy by Jain N. K.; Vallabh Prakashan, New Delhi.
5. Pharmaceutical Regulatory Affairs - Selected Topics, CVS Subramanyam and J Thimmasetty, Vallabh Prakashan Delhi - 2013

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Chemistry)

DRUG DISCOVERY AND DESIGN (Professional Elective – II)

Course Objective: The topics are framed to enhance the student's knowledge in the various areas of molecular modelling, molecular docking, pharmacophore concepts, drug design techniques with detail concepts of all the mentioned areas.

Course Outcome: This enables the students to get a broad idea on the drug discovery mechanisms, its related terms and concepts of designing of drugs.

UNIT - I
Molecular modelling: Molecuelar Mechanics, Quantum Mechanics, Energy minimization, geometry optimization, conformational analysis, global conformational minima determination; approaches and problems. Bioactive vs. Global minimum conformations. Automated methods of conformational search. Advantages and limitations of available software. Molecular graphics. Molecular properties, reactivity, Homo, Lumo, Electrostatic potential, Solvent accessible surface.

UNIT - II
Pharmacophore concept: Pharmacophore mapping, methods of conformational search used in pharmacophore mapping. Comparison between the popular pharmacophore methods like Catalyst/HipHop, DiscoTech, GASP with practical examples, 3D QSAR Techniques.

UNIT - III
Design of drugs for the following biological targets Agent acting on enzymes: DHFR, HIV-protease HMG-CoA Reductase, Phosphodiesterase, ACE, Transpeptidase, β-lactamase. Agents acting on receptors: PPAR, protein kinases. Agents acting on Nucleic acids: Topoisomerase, DNA and RNA polymerase, HIV-Reverse transcriptase

UNIT - IV
Molecular docking: Rigid docking, flexible docking, manual docking. Advantages and disadvantages of Flex-X, Flex-S, Autodock and Dock softwares, with successful examples. Molecular dynamics: Dynamics of drugs, biomolecules, drug-receptor complexes, Monte Carlo simulations and Molecular dynamics in performing conformational search and docking. Estimation of free energy from dynamical methods.

UNIT - V
De Novo drug design techniques: Receptor/enzyme cavity size prediction. Predicting the functional components of cavities, designing drugs fitting into cavity. Active site analysis structure – based drug design. Informatics methods in drug design: Informatics methods in drug design: Brief introduction to bioinformatics, chemoinformatics.

REFERENCES:

1. Robert GCK, ed., "Drug Action at the Molecular Level" University Prak Press Baltimore.
2. Martin YC. "Quantitative Drug Design" Dekker, New York.
3. Lien EJ. SAR "Side effects and Drug Design" Dekker, New York.
4. William H, Malick JB "Drug Discovery and Development" Humana Press Clifton.
5. Molecular Modelling, by A. R. Leach
6. Organic Chemistry of Drug Design and Drug Action, by R.B. Silverman
7. Practical Applications of computer aided drug design, by P.S. Charifson

8. Molecular modeling in Drug Design, by C. Cohen
9. Chemical Applications of Molecular modeling, by J. Goodman
10. Pharmacophore perception, by O.F. Guner

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Chemistry)

PHARMACEUTICALS AND FOOD ANALYSIS (Professional Elective – II)

Course Objective: This course is designed to impart knowledge on analysis of food constituents and finished food products. The course includes application of instrumental analysis in the determination of pesticides in variety of food products.

Course Outcome: At completion of this course student shall be able to understand various analytical techniques in the determination of

- Food constituents
- Food additives
- Finished food products

UNIT I

a. Carbohydrates: Classification and properties of food carbohydrates, General methods of analysis of food carbohydrates,

b. Proteins: Chemistry and classification of amino acids and proteins, Physico-Chemical properties of protein and their structure, general methods of analysis of proteins and amino acids

UNIT II

Probiotics: Definition, history, importance, mode of action, identification advantages and disadvantages of probiotics. Applications of Probiotics

UNIT III

Lipids: Classification, general methods of analysis, refining of fats and oils; hydrogenation of vegetable oils, Determination of adulteration in fats and oils.

UNIT IV

Vitamins: Classification of vitamins, methods of analysis of vitamins, Principles of microbial assay of vitamins of B-series

UNIT V

b. **General Analytical methods** for milk, milk constituents and milk products like ice cream, milk powder, butter, margarine, cheese including adulterants and contaminants of milk.

c. **Analysis of fermentation products** like wine, spirits, beer and vinegar.

- Pesticides in food
- And also student shall have the knowledge on food regulations and legislations

TEXT BOOKS:

1. The chemical analysis of foods – David Pearson, Seventh edition, Churchill Livingstone, Edinburgh London, 1976
2. Introduction to the Chemical analysis of foods – S. Nielsen, Jones & Bartlett publishers, Boston London, 1994.
3. Official methods of analysis of AOAC International, sixth edition, Volume I & II, 1997.
4. Analysis of Food constituents – Multon, Wiley VCH.
5. Dr. William Horwitz, Official methods of analysis of AOAC International
6. 18th edition, 2005.Theory and Practice of Industrial Pharmacy by Lieberman and Lachman

REFERENCE BOOKS:

1. Remington's Pharmaceutical Sciences by Alfonso and Gennaro
2. David Pearson. The Chemical Analysis of Foods, 7th ed., Churchill Livingstone, Edinburgh, 1976.
3. Nielsen S. Introduction to the chemical analysis of foods. Jones & Bartlett Publishers, Boston, 1974
4. Indian Pharmacopoeia 2012

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Chemistry)
SPECTRAL ANALYSIS (Professional Elective – II)

Course Objective: The students will acquire the knowledge about the various aspects of X-Ray diffraction methods, all types of IR methods, particle sizing methods, also DSC, DTA, TGA etc

Course Outcome: By the completion of topics the students will come out with the thorough knowledge of various spectral aspects of X-Ray, IR, SEM, ORD etc which help them in further projects works and also industrial opportunities.

UNIT - I

X-Ray diffraction methods: Origin of X-rays, basic aspects of crystals, X-ray crystallography, miller indices, rotating crystal techniques, single crystal diffraction, power diffraction, structural elucidation and applications.

UNIT - II

a) **FT-NIR:** Principle (overtones, combinations, fermi resonance, interferences etc.), instrumentation (dispersion spectrometer and FT-NIR), advantage and disadvantage, qualitative and quantitative applications, including PAT and non-destructive analysis.
b) **ATR:** Principle (total internal reflection, evanescent wave, etc.), instrumentation (ATR crystal, IR beam), advantages and disadvantages, pharmaceutical applications.

UNIT - III

ELECTROMETRIC TECHNIQUES: Principle, instrumentation and applications of Potentiometer, Amperometer, Conductometer and Polarography.

UNIT - IV

a) **Spectroflourimetry:** Theory of Fluorescence, Factors affecting fluorescence (Characteristics of drugs that can be analysed by flourimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.
b) **Flame emission spectroscopy and Atomic absorption spectroscopy:** Principle, Instrumentation, Interferences and applications.

UNIT - V

FT-Raman: Principle (absorption, diffraction, scattering and emission of wave, molecular interaction), instrumentation (Dispersive Raman, FT-Raman), advantage and disadvantage, pharmaceutical applications including detection of counterfeit

REFERENCES:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. A Text book of Pharmaceutical Analysis by Kerrenth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein
11. HPTLC by P.D. Seth
12. Spectroscopy by Donald L Pavia, Gary M Lampman, George S Kriz, James A Vyvyan

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Chemistry)

RESEARCH METHODOLOGY AND IPR

Course Objectives:

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

Course Outcomes: At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT - I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT - II

Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT - III

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT - IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-V:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science &engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

REFERENCES:

1. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
2. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
3. Mayall, “Industrial Design”, McGraw Hill, 1992.
4. Niebel, “Product Design”, McGraw Hill, 1974.
5. Asimov, “Introduction to Design”, Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”, 2016.
7. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Chemistry)

ADVANCED ORGANIC CHEMISTRY – I LAB (LAB – I)

List of Experiments: (Minimum of 10 experiments shall be conducted)

1. Synthesis and characterization of the following drugs:

a. Benzanilide by Beckmann rearrangement
b. 4-Benzylidene-2-methyloxazol-5-one (or) azalactone
c. N-(m-Nitrobenzyl) aniline from m-nitrobenzaldehyde
d. 2, 3-Diphenyl quinoxaline
e. 1H-Indole-3-carboxaldehyde
f. 3, 4-Dihydropyrimidin-2(1H)-one from benzaldehyde, ethyl acetoacetate and urea in presnce of $CaCl_2$ (catalyst).
g. Schiff base by microwave irradiation
h. Cinnamic acid by Perkin reaction
i. β-Ddimethylaminopropiophenone hydrochloride (Mannich base)
j. 2-Phenyl indole
k. Dimedone (5,5-dimethyl cyclohexane-1,3-dione)
l. 3-Bromo cyclohexene from cyclohexene using NBS.
m. p-Amino benzyl alcohol from p-amino benzaldehyde using sodium borohydride.
n. Cyclohexane-2,5-dicarboxylic acid from benzoic acid (hydrogenation).

2. Any other relevant experiments based on theory.

REFERENCES:

1. Roth HJ, Kleemann A. Pharmaceutical Chemistry. Vol-I. Drug synthesis. New York: Ellis Horwood Limited; 1988.
2. Mann FG, Saunders BC. Practical organic chemistry. 4th ed. New Delhi: Orient Longman; 2005.
3. Furniss BS, Hanaford AJ, Smith PWG, Tatchell AR. Vogel's textbook of practical organic chemistry. 5th ed. Singapore: Longman Singapore Publishers P Ltd; 1989.
4. Vogel A. Elementary practical organic chemistry. Part 1: Small scale preparations. 2nd ed. New Delhi: CBS publishers and distributors; 2004.
5. Bansal RK. Laboratory manual of organic chemistry. 4th ed. New Delhi: New Age International (P) limited; 2005.
6. Kar A. Advanced Practical Medicinal Chemistry. New Delhi: New Age International (P) limited; 2006.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Chemistry)

ADVANCED MEDICINAL CHEMISTRY – I LAB (LAB – II)

List of Experiments:

1. Synthesis of any two drugs from the following classes of drugs (Minimum two from each class)
    a. Analgesics, NSAIDS and antipyretics
    b. CNS and CVS drugs
2. QSAR Studies by using softwares
    a. CoMFA – 3D QSAR method,
    b. CODESSA,
    c. descriptor software (all are free online sot wares) minimum of 3 experiments
3. Docking studies of drugs by using free online softwares like
    a. AutoDock,
    b. BLAST,
    c. GPCR pred,
    d. FASTA,
    e. ATPINT,
    f. Maestro,
    g. ESLPRED2 (Minimum of 5 experiments)

PRINCIPAL
Princeton College of Pharmacy,
Kommula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Chemistry)

ENGLISH FOR RESEARCH PAPER WRITING (Audit Course - I & II)

Prerequisite: None

Course objectives: Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

UNIT-I:
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-II:
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-III:
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV:
key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT-V:
skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

TEXT BOOKS/ REFERENCES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Chemistry)

DISASTER MANAGEMENT (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches,
- planning and programming in different countries, particularly their home country or the countries they work in

UNIT-I:

Introduction:

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India:

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-II:

Repercussions of Disasters and Hazards:

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III:

Disaster Preparedness and Management:

Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-IV:

Risk Assessment Disaster Risk:

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT-V:

Disaster Mitigation:

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

TEXT BOOKS/ REFERENCES:

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “’New Royal book Company.
2. Sahni, Pardeep Et. Al. (Eds.),” Disaster Mitigation Experiences and Reflections”, Prentice Hall of India, New Delhi.
3. Goel S. L., Disaster Administration and Management Text and Case Studies”, Deep &Deep Publication Pvt. Ltd., New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Chemistry)

SANSKRIT FOR TECHNICAL KNOWLEDGE (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Course Outcomes: Students will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

UNIT-I:
Alphabets in Sanskrit,

UNIT-II:
Past/Present/Future Tense, Simple Sentences

UNIT-III:
Order, Introduction of roots,

UNIT-IV:
Technical information about Sanskrit Literature

UNIT-V:
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TEXT BOOKS/ REFERENCES:

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Chemistry)

VALUE EDUCATION (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

Course outcomes: Students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality

UNIT-I:
Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

UNIT-II:
Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

UNIT-III:
Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

UNIT-IV:
Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT-V:
Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation, Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

TEXT BOOKS/ REFERENCES:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Chemistry)

CONSTITUTION OF INDIA (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

UNIT-I:
History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working), **Philosophy of the Indian Constitution:** Preamble**,** Salient Features.

UNIT-II:
Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality**,** Right to Freedom**,** Right against Exploitation**,** Right to Freedom of Religion**,** Cultural and Educational Rights**,** Right to Constitutional Remedies, Directive Principles of State Policy**,** Fundamental Duties.

UNIT-III:
Organs of Governance: Parliament**,** Composition**,** Qualifications and Disqualifications**,** Powers and Functions**,** Executive**,** President**,** Governor**,** Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

UNIT-IV:
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT-V:
Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

TEXT BOOKS/ REFERENCES:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Chemistry)

PEDAGOGY STUDIES (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Course Outcomes: Students will be able to understand:

- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

UNIT-I:
Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

UNIT-II:
Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT-III:
Evidence on the effectiveness of pedagogical practices, Methodology for the indepth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the scho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT-IV:
Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT-V:
Research gaps and future directions: Research design**,** Contexts**,** Pedagogy**,** Teacher education**,** Curriculum and assessment**,** Dissemination and research impact.

TEXT BOOKS/ REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.

4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Chemistry)

STRESS MANAGEMENT BY YOGA (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To achieve overall health of body and mind
- To overcome stress

Course Outcomes: Students will be able to:

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

UNIT-I:
Definitions of Eight parts of yog. (Ashtanga)

UNIT-II:
Yam and Niyam.

UNIT-III:
Do`s and Don't's in life.
i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT-IV:
Asan and Pranayam

UNIT-V:
i) Various yog poses and their benefits for mind & body
ii) Regularization of breathing techniques and its effects-Types of pranayam

TEXT BOOKS/ REFERENCES:

1. 'Yogic Asanas for Group Tarining-Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

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M.Pharm (Pharmaceutical Chemistry)

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS
(Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Course Outcomes: Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

UNIT-I:

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

UNIT-II:

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-III:

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT-IV:

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

UNIT-V:

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

TEXT BOOKS/ REFERENCES:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.PHARMACY (PHARMACEUTICS / PHARMACEUTICAL TECHNOLOGY)

R19 COURSE STRUCTURE AND SYLLABUS
Effective from Academic Year 2019-20 Admitted Batch

I YEAR I Semester

Course Code	Course Title	L	T	P	Credits
Professional Core-I	Modern Pharmaceutics-I	3	0	0	3
Professional Core-II	Applied Biopharmaceutics and Pharmacokinetics	3	0	0	3
Professional Elective-I	1. Advanced Physical Pharmaceutics 2. Drug Regulatory affairs 3. Total Quality Management	3	0	0	3
Professional Elective-II	1. Cosmetics and Cosmeceuticals 2. Pharmaceutical Validation 3. Stability of Drugs and Dosage Forms	3	0	0	3
MC	Research methodology and IPR	2	0	0	2
Laboratory- I	Modern Pharmaceutics – I Lab	0	0	4	2
Laboratory- II	Applied Biopharmaceutics and Pharmacokinetics Lab	0	0	4	2
Audit	Audit Course- I	2	0	0	0
	TOTAL	**16**	**0**	**8**	**18**

I YEAR II Semester

Course Code	Course Title	L	T	P	Credits
Professional Core-III	Modern Pharmaceutics-II	3	0	0	3
Professional Core-IV	Advanced Drug Delivery Systems	3	0	0	3
Professional Elective-III	1. Industrial Pharmacy 2. Herbal Cosmetics 3. Pharmaceutical Management	3	0	0	3
Professional Elective-IV	1. Nano based Drug Delivery Systems 2. Nutraceuticals 3. Clinical Research and Pharmacovigilance	3	0	0	3
Laboratory- III	Modern Pharmaceutics – II Lab	0	0	4	2
Laboratory- IV	Advanced Drug Delivery System Lab	0	0	4	2
--	Mini project with seminar	2	0	0	2
Audit	Audit Course- II	2	0	0	0
	Total	**16**	**0**	**8**	**18**

Audit Courses 1 & 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technological Learning
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutics/Pharmaceutical Technology)

MODERN PHARMACEUTICS – I (Professional Core-I)

Course Objectives: Students will know the preformulation studies, methodology, different excipients used in solid dosage forms and their evaluation with references to production technologies. The students also know the optimization techniques and their applications in pharmaceutical industries.

Course Outcome: Students shall explain the preformulation parameters, apply ICH guidelines and evaluate drug, drug excipients compatibility. Students also explain about formulation and development, use of excipients in tablets, powders, capsules, micro-encapsules and coating techniques. They also learn and apply the statistical design in different formulations.

UNIT I
Preformulation studies: Goals of Preformulation, preformulation parameters, Polymorphs and Amorphous forms, selection of drugs- solubility, partition coefficient, salt forms, humidity, solid state properties, Particle Size Analysis (Laser Diffraction and Dynamic Light Scattering) drug-excipient compatibility, flow properties, format and content of reports of preformulation, preformulation stability studies (ICH**)**

UNIT II
Formulation development of solid dosage forms – I: New materials, excipients science - diluents, disintegrants, superdisintegrants, etc, evaluation of functional properties of excipients, co-processed materials, methods of preparation and evaluation.

UNIT III
Formulation development of solid dosage forms– II: Coating, coating machines, coating techniques in tablet technology for product development, computerization, inprocess control of tablets, formulation development and manufacture of powder dosage forms for internal use.
Microencapsulation- types, methodology, problems encountered.

UNIT IV
Formulation development of soft and hard gelatin capsules: Introduction, production and methods of manufacture, filling equipment and filling operations, formulations, finishing, special techniques, advances in capsule manufacture, machines, processing and control including pharmaceutical aspects, physical stability and packaging.

UNIT V
Optimization techniques in pharmaceutical formulation and processing: Introduction, optimization parameters, statistical design, response surface method, contour diagrams, factorial design, partial factorial design, simplex methods, mixture designs, Placket Burhan method, Box Benken method, applications in pharmaceutical formulation.

TEXT BOOKS

1. Pharmaceutics - The Science of Dosage form design by ME Aulton.
2. Pharmaceutical Dosage forms - Tablets (Vol I, II and III) by Lieberman, Lachman and Schwartz.
3. Pharmaceutical Dosage forms - Capsules (Vol I, II and III) by Avis, Lieberman and Lachman.
4. Pharmaceutical Dosage forms – Disperse systems (Vol I, II and III) by Avis, Lieberman and Lachman.
5. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.

6. Pharmaceutical statistics by Bolton

RECOMMENDED BOOKS:

1. The Theory and Practice of industrial Pharmacy by Leon Lachman, Herbert A. Lieberman.
2. Remington's Science and Practice of Pharmacy by A. Gennaro.
3. Ansel's Pharmaceutical Dosage form and Drug delivery system by Loyd V. Allen, Jr. Nicholas G. Popovich, Howard C. Ansel.
4. Generic Drug Product Development by Leon Shargel and Isadore Kanfer.
5. Dispensing for Pharmaceutical Students by SJ Carter.
6. Industrial Pharmacy - Selected Topics, CVS Subramanyam and J Thimmasetty, Vallabh Prakashan Delhi – 2013

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M.Pharm I Year I Sem (Pharmaceutics/Pharmaceutical Technology)

APPLIED BIOPHARMACEUTICS AND PHARMACOKINETICS (Professional Core – II)

Course Objectives: The student shall know about bioavailability, bioequivalence and factor affecting bioavailability. They also know the pharmacokinetic parameter like drug disposition, absorption, non-linear and time dependant pharmacokinetics. They also know about the drug interactions & problems associated in pharmacokinetic parameters calculations.

Course Outcomes: students will be able to tell factors affecting the bioavailability and stability of dosage form; they also know the bioequivalence studies and protocols for bioequivalent studies. They also know the parameters for the disposition, absorption and Michaelis-Menton constants for non-linear kinetics.

UNIT I

a. Biological and metabolic factors affecting bioavailability, complexation, dissolution - techniques of enhancing dissolution.
b. Formulation factors affecting bioavailability of drugs in dosage forms of tablets, capsules, parenterals, liquid orals and topical dosage forms.
c. **Bioavailability:** Importance, dose dependency, AUC, rate and extent, assessment, blood and urine samples, single dose and multiple dose studies, *Invitro- Invivo* Correlation analysis and Levels of Correlations.
d. **Bioequivalence:** Importance equivalency concepts, biowaivers, study designs, protocol, transformation of data, Statistical Criteria as per the Regulations.

UNIT II

Pharmacokinetics – Drug Disposition: compartment models: One, two and non-compartmental approaches to pharmacokinetics. Recent trends, merits and limitations of these approaches. Application of these models to determine the various pharmacokinetic parameters pertaining to:

a. Distribution: Apparent volume of distribution and its determination, factors affecting.
b. Metabolism: Metabolic rate constant, Factors affecting Metabolism
c. Elimination: Over all apparent elimination rate constant, and half life.
   All the above under the following conditions:
   1. Intravenous infusion
   2. Multiple dose injections
d. Non-invasive methods of estimating pharmacokinetics parameters with emphasis on salivary and urinary samples.
e. Concept of clearance: organ, total clearance, hepatic clearance, lung clearance and renal clearance.

UNIT III

Pharmacokinetics – Absorption: Rate constants **–** Zero order, first order,Models of experimental study of absorption (in silico, in vitro, in situ and in vivo) – Absorption half lives, method of residuals, Wagner – Nelson method, Loo - Reigleman method, Analysis of kinetics from urine samples. Pharmacokinetic parameters determination pertaining to: Multiple dosage oral administration.

UNIT IV

Non-linear pharmacokinetics: Concepts of linear and non-linear pharmacokinetics, Michaelis-Menton kinetics characteristics. Basic kinetic parameters, possible causes of non-induction, non-linear binding, and non-linearity of pharmacological responses.

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Clinical Pharmacokinetics: Altered kinetics in pregnancy, child birth, infants and geriatrics. kinetics in GI disease, malabsorption syndrome, liver, cardiac, renal and pulmonary disease states.

UNIT V

Time dependent pharmacokinetics: Introduction, classification, physiologically induced time dependency: Chronopharmacokinetics - principles, drugs– (amino glycosides, NSAIDS, antihypertensive drug) chemically induced dependency.

Drug Interactions: Kinetics of drug interaction, study of drug-drug interaction mediated through absorption, distribution, metabolism and elimination, mechanisms of interaction and consequence.

- ❖ Numerical problems associated with all units, if any.

TEXT BOOKS

1. Biopharmaceutics and Clinical Pharmacokinetics by Milo Gibaldi.
2. Learn Shargel and ABC yu, Applied Biopharmacokinetics and Pharmacokinetics
3. Biopharmaceutics and Pharmacokinetics by C.V.S. Subrahmanyam, Vallabh Prakashan.2010.
4. Basic biopharmaceutics, Sunil S. Jambhekar and Philip J Brean.
5. Text book of Biopharmaceutics and Clinical Pharmacokinetics by NiaziSarfaraz

REFERENCE BOOKS

1. Bio-Pharmaceutics and Pharmacokinetics by V. Venkateshwarlu.
2. Pharmacokinetics, Biopharmaceutics and Clinical pharmacy by Robert E. Notari.
3. Biopharmaceutics and Clinical Pharmacokinetics - An Introduction by Robert E. Notari.
4. Drug drug interactions, scientific and regulatory perspectives by Albert P. G

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutics/Pharmaceutical Technology)

ADVANCED PHYSICAL PHARMACEUTICS (Professional Elective – I)

Course Objectives: the students shall know about particle science, polymer science and its use in pharmaceutical dosage forms. They also know the compression and consolidation parameters for powders and granules. Students also know about the rheology, disperse systems, dissolution and solubility parameters for dosage forms.

Course Outcomes: The students will know particle size analysis method, solid dispersion, physics of tablets, polymer classification and its applications, student will also know the stability calculations, shelf life calculations and accelerated stability studies. They also know the rheology, absorption related to liquids and semi-solid dosage forms. They also know the factors affecting the dissolution and solubility in related to invitro/invivo correlations.

UNIT I

Polymer science: Classification, properties and characterization of polymers, phase separation, polymers in solid state, preparation of polymer solution, application of polymers in pharmaceutical formulations. Mechanism of biodegradation of biodegradable polymers including controlled drug delivery systems, Mucoadhesive, Hydrodynamically balanced and Transdermal Systems.

UNIT II

Physics of tablet compression: Basic principles of interactions, compression and consolidation, compression and consolidation under high loads, effect of friction, distribution of forces in compaction, force volume relationships, Heckel plots, compaction profiles, energy involved in compaction, Measurement of compression with strain gauges, compression pressure-QA parameters.

UNIT III

Kinetics and drug stability: Stability calculations, rate equations, complex order kinetics, Factors influencing stability, strategy of stability testing, method of stabilization, method of accelerated stability testing in dosage forms, temperature and humidity control, physical stability testing of pharmaceutical products. Photodecomposition, Method, solid state decomposition.

UNIT IV

Viscoelasticity: Theoretical consideration, instrumentation, rheological properties of disperse systems and semisolids. Oscillatory testing, Creep measurement.

Characterization of API and excipients: Differential Scanning Calorimetry: Principle, thermal transitions, advantages, disadvantages, instrumentation, applications and interpretations

X Ray Diffraction methods: Origin of x-rays, principle, advantages, disadvantages, instrumentation, applications and interpretations.

UNIT V

Dissolution and solubility: Solubility and solubilization of nonelectrolytes, solubilization by the use of surfactants, cosolvents, complexation, drug derivatisation and solid state manipulation, Mechanisms of Drug release - dissolution, diffusion (Matrix and Reservoir) and swelling controlled (Peppas Model) and dissolution equipment.

TEXT BOOKS

1. Physical Pharmacy, 4th Edition by Alfred Martin.
2. Theory and Practice of Tablets – Lachman, Vol.4

3. Pharmaceutical Dosage forms – Disperse systems Vol. I & II
4. Cartenson “Drug Stability, Marcel Decker Solid state properties, Marcel Dekker.
5. Industrial Pharmacy - Selected Topics, CVS Subramanyam and J Thimmasetty, Vallabh Prakashan Delhi - 2013

REFERENCE BOOKS

1. Dispersive systems I, II, and III
2. Robinson. Controlled Drug Delivery Systems

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M.Pharm I Year I Sem (Pharmaceutics/Pharmaceutical Technology)

DRUG REGULATORY AFFAIRS (Professional Elective-I)

Course Objectives: The topics which are present in the Drug regulatory affairs are very much useful which increases the knowledge regarding the regulatory aspects in the pharmaceutical industries.

Course Outcomes:

- Students will come to know the different competent regulatory authorities globally.
- Students be aware of technical aspects pertaining to the marketing authoritization application (MAA)
- The regulatory guidelines and directions framed by the regulatory authorities will be helpful to place the drug products in market for marketing approvals.

UNIT I

Drug Regulatory Aspects (India)

1. Indian drug regulatory authorities, Central and State regulatory bodies (FDA)
2. Drugs and Cosmmetics Act and Rules with latest Amendments (Selective)
3. Special emphasis – Schedule M and Y
4. New drugs – Importation, Registration, development, Clinical Trials, BE NOC & BE studies
5. Various Licences – Test Lic., Import lic., for testing of drugs and API's, Manufacturing Contract and Loan licence manufacturing.

UNIT II

Good Manufacturing Practices (GMP)

1. Indian GMP certification, WHO GMP certification.
2. ICH guidelines for stability testing and other relevant ones (Q1-Q10)
3. Export permissions and manufacturing for semi-regulated countries
4. Understanding of the plant layouts with special emphasis on the environment &safety.(HVAC, Water Systems, Stores Managemant, Effluent etc.)
5. Quality Assurance and Qulaity Control – Basic understanding for in-built quality.

UNIT III

A detailed study of regulatory aspects that affect drug product design, manufacture and distribution in a developed country such as USA and in a developing country such as Brazil, Hatch Waxmann Act; Bolar Provisions and other FDA Regulations. Regulatory aspects of pharmaceutical and bulk drug manufacture, regulatory drug analysis.

UNIT IV

Documentation related to manufacturing, cleaning methods, retention samples and records, quality control, batch release documents, distribution records, complaints and recalls.
Quality, safety and legislation for cosmetic products and herbal products.

UNIT V

Governing Regulatory Bodies across the globe.

Country Authority Submission

a. U.S Food & Drug Administration USDMF
b. Canada Therapeutic Product Directorate DMF
c. Europe
    1) European Medicines Agency (EMEA/ National Authorities) EDMF
    2) European Directorate for Quality of Medicines CEP/COS & Health Care Products.

3) MHRA – Medicines and Health Care Products Regulatory Agency

d. Product Filing
e. Responding Regulatory Deficiencies
f. Final Approval Procedure

Preparation, review and submission of Drug Master Files to Regulatory Authorities as per their specific requirements.

TEXT AND REFERENCE BOOKS

1. Original laws published by Govt. of India.
2. Text Book of Forensic Pharmacy by Mithal B. M.; Vallabh Prakashan, New Delhi.
3. Laws of Drugs in India by Hussain.
4. Text Book of Forensic Pharmacy by Jain N. K.; Vallabh Prakashan, New Delhi.
5. Pharmaceutical Regulatory Affairs - Selected Topics, CVS Subramanyam and J Thimmasetty, Vallabh Prakashan Delhi - 2013

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutics/Pharmaceutical Technology)

TOTAL QUALITY MANAGEMENT (Professional Elective - I)

Course Objectives: Total quality management constitutes very useful chapter like –good manufacturing practices, GLP, GCP, ICH etc. Which increases the knowledge of students in various quality control & regulatory aspects.

Course Outcomes: Total quality management helps the students to learn the established regulatory guidelines in GMP, GCP, GLP, USFDA, WHO, ISO etc to become a perfect budding pharmacist. It is very useful to students to acquire vast knowledge regarding the quality control aspects of different regulatory bodies as per their requirements throughout the world.

UNIT - I
Concepts and Philosophy of TQM, GLP, GMP (orange guide).

UNIT – II
Drug regulatory and accrediting agencies of the world (USFDA, TGA, ICH, WHO, ISO etc.)

UNIT - III
Good manufacturing practices: Organization and personnel, responsibilities, training, hygiene. Premises: Location, design, plant layout, construction, maintenance and sanitation, environmental control, utilities and services like gas, water, maintenance of sterile areas, control of contamination. Equipments: Selection, purchase specifications, maintenance, clean-in-place, sterilize-in-place, methods (TP and STP). Raw materials: Purchase specifications, maintenance of stores, selection of vendors, controls on raw materials and finished dosage forms. Manufacture of and controls on dosage forms: Manufacturing documents, master formula, batch formula records, standard operating procedures, quality audits of manufacturing processes and facilities. In process quality controls on various dosage forms; sterile and non–sterile, standard operating procedures for various operations like cleaning, filling, drying, compression, coating, disinfections, sterilization, membrane filtration etc., Packaging and labelling control, line clearance, reconciliation of labels, cartons and other packaging materials. Quality Control Laboratory: Responsibilities, good laboratory practices, routine controls instruments, reagents, sampling plans, standard test procedures, protocols, non-clinical testing, controls on animal house. Data generation and storage, quality control documents, retention samples, records and audits of quality control facilities. Finished products release, quality review, quality audits, batch release document.

UNIT - IV
Regulatory Considerations for Pre-clinical and Clinical Evaluation: Pre-clinical requirements currently in use. Regulatory requirements of single dose and repeat dose toxicity studies. Study of specific toxicities such as mutagenicity, carcinogenicity and teratoginicity. Animal pharmacokinetics and toxicokinetics. Regulatory requirements of clinical evaluation, pharmacokinetics in man genetic polymorphism. Design and interpretation of clinical trials. Quality assurance standards as per ISO.

UNIT - V
Globalization of drug industry, present status and scope of pharmaceutical industry in India. WHO and NABL certification, ICH guidelines for manufacturing and quality assurance of drug formulation.

TEXT AND REFERENCE BOOKS:

1. Guidelines for Developing National Drug Policies; WHO Publications, 1998.

2. Quality Assurance of Pharmaceuticals–A Compendium of Guidelines and Related Materials, Vol.–1; WHO Publications.
3. A Guide to Total Quality Management by Kaushik Maitra and Sedhan K. Ghosh.
4. GMP by Mehra.
5. How to Practice GMP by P.P. Sharma.
6. ISO 9000 and Total Quality Management by Sadhan K. Ghosh.
7. Good Manufacturing Practices for Pharmaceuticals-A Plan for Total Quality Control by Sidney H. Willing & James R Stoker. (Drugs & Pharm. Sciences) Vol. 78; Marcel Dekker Inc.
8. OPPI-Quality Assurance, USP.
9. Current good manufacturing practices for pharmaceuticals by Manohar A. Potdar
10. Quality assurance and quality management in pharmaceutical industry by Y. Anjaneyulu and marayya
11. Total Quality Management, An integrated Approach by D. R. Kiran, BS Publications
12. Total Quality Management, 3rd edition by Joel E. Ross. CRC press

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutics/Pharmaceutical Technology)

COSMETICS AND COSMECEUTICALS (Professional Elective - II)

Course Objectives: Upon completion of the course, the students shall be able to understand

- Key ingredients used in cosmetics and cosmeceuticals.
- Key building blocks for various formulations.
- Current technologies in the market
- Various key ingredients and basic science to develop cosmetics and cosmeceuticals
- Scientific knowledge to develop cosmetics and cosmeceuticals with desired Safety, stability, and efficacy.

Course Outcomes: Upon completion of the subject student shall able to know Regulatory biological aspects of cosmetics, excipients used for various formulations, designing of cosmeceuticals and herbal products

UNIT I

Cosmetics – Regulatory: Definition of cosmetic products as per Indian regulation. Indian regulatory requirements for labeling of cosmetics Regulatory provisions relating to import of cosmetics. Misbranded and spurious cosmetics. Regulatory provisions relating to manufacture of cosmetics – Conditions for obtaining license, prohibition of manufacture and sale of certain cosmetics, loan license, offences and penalties.

UNIT II

Cosmetics - Biological aspects: Structure of skin relating to problems like dry skin, acne, pigmentation, prickly heat, wrinkles and body odor. Structure of hair and hair growth cycle. Common problems associated with oral cavity. Cleansing and care needs for face, eye lids, lips, hands, feet, nail, scalp, neck, body and under-arm.

UNIT III

Formulation Building blocks: Building blocks for different product formulations of cosmetics/cosmeceuticals. Surfactants – Classification and application. Emollients, rheological additives: classification and application. Antimicrobial used as preservatives, their merits and demerits. Factors affecting microbial preservative efficacy. Building blocks for formulation of a moisturizing cream, vanishing cream, cold cream, shampoo and toothpaste. Soaps and syndetbars.
Perfumes; Classification of perfumes. Perfume ingredients listed as allergens in EU regulation.
Controversial ingredients: Parabens, formaldehyde liberators, dioxane.

UNIT IV

Design of cosmeceutical products: Sun protection, sunscreens classification and regulatory aspects. Addressing dry skin, acne, sun-protection, pigmentation, prickly heat, wrinkles, body odor., dandruff, dental cavities, bleeding gums, mouth odor and sensitive teeth through cosmeceutical formulations.

UNIT V

Herbal Cosmetics: Herbal ingredients used in Hair care, skin care and oral care. Review of guidelines for herbal cosmetics by private bodies like cosmos with respect to preservatives, emollients, foaming agents, emulsifiers and rheology modifiers. Challenges in formulating herbal cosmetics.

REFERENCES

1. Harry's Cosmeticology. 8th edition.
2. Poucher's perfume cosmetics and Soaps, 10th edition.
3. Cosmetics - Formulation, Manufacture and quality control, P. P. Sharma, 4th edition
4. Handbook of cosmetic science and Technology A.O. Barel, M. Paye and H.I. Maibach. 3 rd edition
5. Cosmetic and Toiletries recent suppliers' catalogue.
6. CTFA directory.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutics/Pharmaceutical Technology)

PHARMACEUTICAL VALIDATION (Professional Elective - II)

Course Objective: The main purpose of the subject is to understand about validation and how it can be applied to industry and thus to improve the quality of the products. The subject covers the complete information about validation, types, methodology and application.

Course Outcome: Upon completion of the subject student shall be able to

- Explain the aspect of validation
- Carryout validation of manufacturing processes
- Apply the knowledge of validation to instruments and equipments

UNIT I

Introduction: Definition of Qualification and Validation, Advantage of Validation, Streamlining of Qualification & Validation process and Validation Master Plan.

Qualification: User Requirement Specification, Design Qualification, Factory Acceptance Test (FAT)/ Site Acceptance Test (SAT), Installation Qualification, Operational Qualification, Performance Qualification, Re- Qualification (Maintaining status -Calibration Preventive Maintenance, Change management), Qualification of Manufacturing Equipment, Qualification of Analytical Instruments and Laboratory equipments.

UNIT II

Qualification of analytical instruments: Electronic balance, pH meter, UV-Visible spectrophotometer, FTIR, GC, HPLC, HPTLC

Qualification of Glassware: Volumetric flask, pipette, Measuring cylinder, beakers and burette.

UNIT III

Qualification of laboratory equipments: Hardness tester, Friability test apparatus, tap density tester, Disintegration tester, Dissolution test apparatus.

Validation of Utility systems: Pharmaceutical water system & pure steam, HVAC system, Compressed air and nitrogen.

UNIT IV

Cleaning Validation: Cleaning Validation - Cleaning Method development, Validation and validation of analytical method used in cleaning. Cleaning of Equipment. Cleaning of Facilities. Cleaning in place (CIP).

UNIT V

Analytical method validation: General principles, Validation of analytical method as per ICH guidelines and USP.

- Validate the manufacturing facilities

REFERENCES:

1. T. Loftus & R. A. Nash, "Pharmaceutical Process Validation", Drugs and Pharm Sci. Series, Vol. 129, 3rd Ed., Marcel Dekker Inc., N.Y.
2. The Theory & Practice of Industrial Pharmacy, 3rd edition, Leon Lachman, Herbert A. Lieberman, Joseph. L. Karig, Varghese Publishing House, Bombay.
3. Validation Master plan by Terveeks or Deeks, Davis Harwood International publishing.

4. Validation of Aseptic Pharmaceutical Processes, 2nd Edition, by Carleton & Agalloco, (Marcel Dekker).
5. Michael Levin, Pharmaceutical Process Scale-Upll, Drugs and Pharm. Sci. Series, Vol. 157, 2nd Ed., Marcel Dekker Inc., N.Y.
6. Validation Standard Operating Procedures: A Step by Step Guide for Achieving Compliance in the Pharmaceutical, Medical Device, and Biotech Industries, Syed Imtiaz Haider
7. Pharmaceutical Equipment Validation: The Ultimate Qualification Handbook, Phillip A. Cloud, Interpharm Press
8. Validation of Pharmaceutical Processes: Sterile Products, Frederick J.Carlton (Ed.) and James Agalloco (Ed.), Marcel Dekker, 2nd Ed.
9. Analytical Method validation and Instrument Performance Verification by Churg Chan, Heiman Lam

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutics/Pharmaceutical Technology)

STABILITY OF DRUGS AND DOSAGE FORMS (Professional Elective - II)

Course Objectives: These topics are designed impart a specialized knowledge to preserve the properties of drugs and dosage forms during manufacture storage and shelf life. The understanding of properties and evaluation of stability during storage, by solution and solid state against several factors of degradation.

Course Outcomes: The students should describe the evaluation of stability of solutions, solids and formulations against adverse conditions. The students should be able to suggest the measures to retain stability and storage conditions for retaining the efficacy of the products.

UNIT - I
Drug decomposition mechanisms:

1. Hydrolysis and acyltransfers: Nature of reaction, structure and utility, stabilization of Pharmaceutical examples.
2. Oxidation: Nature of oxidation, kinetics of oxidation, oxidation pathways of pharmaceutical, Interest Inhibition of oxidation
3. Photolysis: Energetics of photolysis, kinetics photolysis, photolytic reactions of pharmaceutical interest, prevention of photolytic reactions.

UNIT - II
Solid state chemical decomposition: Kinetic of solids state decomposition, Pharmaceutical examples of solid-state decomposition, Pure drugs, drug excipient and drug-drug interaction in solid state, methods of stabilization.
Physical stability testing of dosage forms:

1. Solids – tablets, capsules, powder and granules
2. Disperse systems
3. Microbial decomposition
4. Over-view, physical stability of novel drug carriers, liposomes, niosomes, nano-particles.

UNIT - III
Identification and quantitative determination of preservatives, Antioxidants, colouring materials, emulsifiers and stabilizers in Pharmaceutical formulation.
Analysis of drugs from biological samples including, selection of biological sample, extraction of drugs by various methods as LLE, SPE and Membrane filtration.Factors affecting extraction of drugs.

UNIT - IV
General method of analysis to determine the quality of raw materials used in cosmetic industry. Indian Standard Specifications (ISI) laid down for sampling and testing of various cosmetics in finished form by the Bureau of Indian Standards.

UNIT - V
Methods of analysis to determine the quality of cosmetics in the finished forms such as Hair care products, Skin care products, Baby care products, Dental products, Personal hygiene products, Colour cosmetics, Ethnic products, Colour makeup preparation, Lipsticks, Hair setting lotions and Eye shadows. Toxicity testing in cosmetics and Safety and Legislation of Cosmetic products.
Stability studies: Concept of stability studies.
a) cGMP& ICH guidelines for Accelerated stability Testing.
b) Interaction of containers & closure Compatibility Testing.

REFERENCE BOOKS:

1. Comprehensive Pharmacy Review 5th Edition by Leon Shargel, Alan H. Mutnick, Paul F. Souney, Larry N. Sawnson – 2004.
2. A. H. Beckett and J. B. Stenlake Practical Pharmaceutical Chemistry, Part I and Part II, 4th Edition. 3. G. H. Jeffery, J. Basset, J. Mendham, R. C. Denny (Rev. by) Vogels Text Book of Quantitative Chemical Analysis, 5th Edition 1989, ELBS.
3. The Controller of Publications; New Delhi, Govt. of India, Indian Pharmacopoeia, Vol. I and Vol. II - 2010.
4. J. B. Wilkinson and R. J. Moore, Herry's Cosmeticology; Longman Scientific and Technical Publishers, Singapore.
5. P.D. Sethi; Quantitative Analysis of Drugs in Pharmaceutical Formulations, 3rd Edition - 1997,
6. Classification of cosmetics raw materials and adjuncts IS 3958 of Indian Standards Institution (BIS).
7. Cosmetic and toilet goods – methods of sampling IS 3958 of Indian Standards Institution (BIS).
8. Methods of sampling and test for various cosmetics as laid down by Bureau of Indian Standards.
9. Drug stability: Principles and practices by Jens T. Carstensen
10. Stability Testing of Drug Products by W. Grimm.
11. Stability of Drugs and Dosage Forms by Yoshioka and Stella.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutics/Pharmaceutical Technology)

RESEARCH METHODOLOGY AND IPR

Course Objectives:

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

Course Outcomes: At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT - I:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT - II:

Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT - III:

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT - IV:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-V:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

REFERENCES:

1. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
2. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
3. Mayall, “Industrial Design”, McGraw Hill, 1992.
4. Niebel, “Product Design”, McGraw Hill, 1974.
5. Asimov, “Introduction to Design”, Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”, 2016.
7. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutics/Pharmaceutical Technology)

MODERN PHARMACEUTICS – I LAB (Laboratory-I)

List of Experiments:

1. To carry out the preformulation studies of solid dosage forms**.**
2. To study the effect of compressional force on tablet disintegration time
3. To study the micromeritic properties of powders and granules
4. To study the effect of particle size on dissolution of tablets
5. To study the effect of binders on dissolution of tablets
6. To study pharmacokinetic models, to determine similarity factors
7. Accelerated stability testing of different tablets
8. Determination of first order, second order rate constants by acid and alkaline hydrolysis
9. Preparation and evaluation of beta cyclodextrin complexes of new drugs
10. Preparation of paracetamol tablets and comparison with marketed products

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutics/Pharmaceutical Technology)

APPLIED BIOPHARMACEUTICS AND PHARMACOKINETICS LAB (Laboratory - II)

List of Experiments:

1. Analysis of dissolution by various data-kinetic modelling.
2. Calibration curve of different API's by UV/HPLC/HPTLC
3. Dissolution of immediate release, sustained release and delayed release.
4. Evaluation of drug-protein binding analysis
5. Assignment of numerical problems, one compartment and two compartment disposition, method of residuals, AUC and evaluation of pharmacokinetic parameters.
6. Calculation of K_a(absorption rate constant) absorption curve- Wagner nelson method , Loo-Riegel method.
7. Calculation of pharmacokinetics parameters of one compartment oral data and two compartment IV data.
8. Construction of IVIVC from the data
9. Calculation of Urinary Pharmacokinetics
10. Calculation of Bioavailability and Bioequivalence Studies
11. Permeation studies of Franz diffusion cell
12. Drug Release from semisolids by Agar gel method or Franz diffusion cell.

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M.Pharm (Pharmaceutics/Pharmaceutical Technology)

ENGLISH FOR RESEARCH PAPER WRITING (Audit Course - I & II)

Prerequisite: None

Course objectives: Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

UNIT-I:
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-II:
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-III:
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV:
key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT-V:
skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

TEXT BOOKS/ REFERENCES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutics/Pharmaceutical Technology)

DISASTER MANAGEMENT (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches,
- planning and programming in different countries, particularly their home country or the countries they work in

UNIT-I:

Introduction:

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India:

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-II:

Repercussions of Disasters and Hazards:

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III:

Disaster Preparedness and Management:

Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-IV:

Risk Assessment Disaster Risk:

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT-V:

Disaster Mitigation:

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

TEXT BOOKS/ REFERENCES:

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “’New Royal book Company.
2. Sahni, Pardeep Et. Al. (Eds.),” Disaster Mitigation Experiences and Reflections”, Prentice Hall of India, New Delhi.
3. Goel S. L., Disaster Administration and Management Text and Case Studies”, Deep &Deep Publication Pvt. Ltd., New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutics/Pharmaceutical Technology)

SANSKRIT FOR TECHNICAL KNOWLEDGE (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Course Outcomes: Students will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

UNIT-I:
Alphabets in Sanskrit,

UNIT-II:
Past/Present/Future Tense, Simple Sentences

UNIT-III:
Order, Introduction of roots,

UNIT-IV:
Technical information about Sanskrit Literature

UNIT-V:
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TEXT BOOKS/ REFERENCES:

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

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M.Pharm (Pharmaceutics/Pharmaceutical Technology)

VALUE EDUCATION (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

Course outcomes: Students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality

UNIT-I:
Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

UNIT-II:
Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

UNIT-III:
Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

UNIT-IV:
Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT-V:
Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation, Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

TEXT BOOKS/ REFERENCES:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutics/Pharmaceutical Technology)

CONSTITUTION OF INDIA (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

UNIT-I:
History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working), **Philosophy of the Indian Constitution:** Preamble**,** Salient Features.

UNIT-II:
Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality**,** Right to Freedom**,** Right against Exploitation**,** Right to Freedom of Religion**,** Cultural and Educational Rights**,** Right to Constitutional Remedies, Directive Principles of State Policy**,** Fundamental Duties.

UNIT-III:
Organs of Governance: Parliament**,** Composition**,** Qualifications and Disqualifications**,** Powers and Functions**,** Executive**,** President**,** Governor**,** Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

UNIT-IV:
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT-V:
Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

TEXT BOOKS/ REFERENCES:

1. The Constitution of India, 1950 (Bare Act), Government Publication.

2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutics/Pharmaceutical Technology)

PEDAGOGY STUDIES (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Course Outcomes: Students will be able to understand:

- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

UNIT-I:

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

UNIT-II:

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT-III:

Evidence on the effectiveness of pedagogical practices, Methodology for the indepth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the scho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT-IV:

Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT-V:

Research gaps and future directions: Research design**,** Contexts**,** Pedagogy**,** Teacher education**,** Curriculum and assessment**,** Dissemination and research impact.

TEXT BOOKS/ REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.

4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutics/Pharmaceutical Technology)

STRESS MANAGEMENT BY YOGA (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To achieve overall health of body and mind
- To overcome stress

Course Outcomes: Students will be able to:

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

UNIT-I:
Definitions of Eight parts of yog. (Ashtanga)

UNIT-II:
Yam and Niyam.

UNIT-III:
Do`s and Don't's in life.
i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT-IV:
Asan and Pranayam

UNIT-V:
i) Various yog poses and their benefits for mind & body
ii) Regularization of breathing techniques and its effects-Types of pranayam

TEXT BOOKS/ REFERENCES:

1. 'Yogic Asanas for Group Tarining-Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutics/Pharmaceutical Technology)

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS
(Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Course Outcomes: Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

UNIT-I:

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

UNIT-II:

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-III:

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT-IV:

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

UNIT-V:

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

TEXT BOOKS/ REFERENCES:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.PHARMACY (PHARMACEUTICAL ANALYSIS)

R19 COURSE STRUCTURE AND SYLLABUS
Effective from Academic Year 2019-20 Admitted Batch

I YEAR I Semester

Course Code	Course Title	L	T	P	Credits
Professional Core-I	Modern Pharmaceutical Analytical Techniques	3	0	0	3
Professional Core-II	Pharmaceutical and Food Analysis	3	0	0	3
Professional Elective-I	1. Advanced Pharmaceutical Analysis 2. Drug Regulatory Affairs 3. Phytochemistry	3	0	0	3
Professional Elective-II	1. Quality control and Quality Assurance 2. Cosmetics and Cosmeceuticals 3. Stability of Drugs and Dosage forms	3	0	0	3
	Research Methodology & IPR	2	0	0	2
Laboratory-I	Modern Pharmaceutical Analytical Techniques lab	0	0	4	2
Laboratory-II	Pharmaceutical and food Analysis Lab	0	0	4	2
Audit - II	Audit course - I	2	0	0	0
	TOTAL	**16**	**0**	**8**	**18**

I YEAR II Semester

Course Code	Course Title	L	T	P	Credits
Professional Core-III	Advanced Instrumental Analysis I	3	0	0	3
Professional Core-IV	Modern Bio-analytical Techniques	3	0	0	3
Professional Elective-III	1. Pharmaceutical Validation 2. Herbal Cosmetics 3. Pharmacoepidemology and Pharmacoeconomics	3	0	0	3
Professional Elective-IV	1. Advanced Instrumental Analysis - II 2. Nutraceuticals 3. Clinical Research and Pharmacovigilance	3	0	0	3
Laboratory-III	Advanced Instrumental Analysis I Lab	0	0	4	2
Laboratory-IV	Modern Bio analytical Techniques Lab	0	0	4	2
	Mini Project with Seminar	2	0	0	2
Audit - II	Audit Course - II	2	0	0	0
	TOTAL	**16**	**0**	**8**	**18**

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II YEAR I Semester

Course Code	Course Title	L	T	P	Credits
Professional Elective-V	1. Biostatistics 2. Scale up and Technology Transfer 3. Production Area Design and Packaging Development	3	0	0	3
Open Elective	Open Elective	3	0	0	3
Dissertation	Dissertation Work Review - II	0	0	12	6
	Total	**6**	**0**	**12**	**12**

II YEAR II SEMESTER

Course Code	Course Title	L	T	P	Credits
Dissertation	Dissertation Work Review - III	0	0	12	6
Dissertation	Dissertation Viva-Voce	0	0	28	14
	Total	**0**	**0**	**40**	**20**

***For Dissertation Work Review - I, Please refer 7.8 in R19 Academic Regulations.**

Audit Courses I & II:

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technological Learning
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Analysis)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (Professional Core - I)

Course Objective: The course is designed to impart the knowledge in the field of Pharmaceutical Analysis. The various modern analytical techniques like UV-Visible, IR, NMR, Mass, GC, HPLC, different chromatographic methods and other important topics are taught to enable the students to understand and apply the principles involved in the determination of different bulk drugs and their formulation. In addition to the theoretical aspects, the basic practical knowledge relevant to the analysis is also imparted.

Course Outcome: The appreciable knowledge will be gained by the students in the Modern Analytical Techniques and can apply the theories in the Analysis of various bulk drugs and their formulations. The students will also be in a position to apply their knowledge in developing the new methods for the determination and validate the procedures.

UNIT I

Introduction to chromatography and classification of chromatographic methods based on the mechanism of separation

a. Column Chromatography: Adsorption and partition, theory, preparation, procedure and methods of detection
b. Thin Layer Chromatography: Theory, preparation, procedures, detection of compounds
c. Paper Chromatography: Theory, different techniques employed, filter papers used, qualitative and quantitative detection
d. Counter – current extraction, solid phase extraction techniques, gel filtration

UNIT II

a. Gas chromatography: Introduction, fundamentals, instrumentation, columns: preparation and operation, detection, derivatization.
b. HPLC: Basic parameters, Principles and instrumentation, solvents and columns used, Operational modes, detection and applications of HPLC
c. HPTLC: Theory and principle, instrumentation, elution techniques and pharmaceutical applications

UNIT III

a. UV-Visible spectroscopy: Introduction, electromagnetic spectrum, absorbance laws and limitations, instrumentation-design and working principle, chromophore concept, auxochromes, Wood-Fisher rules for calculating absorption maximum, applications of UV-Visible spectroscopy
b. IR spectroscopy: Basic principles -Molecular vibrations, vibrational frequency, factors influencing vibrational frequencies, sampling techniques, instrumentation, interpretation of spectra, FT-IR, theory and applications

UNIT IV

Mass spectroscopy: Theory, ionization techniques: electron impact ionization, chemical ionization, field ionization, fast atom bombardment, plasma desorption, fragmentation process: types of fission, resolution, GC/MS, ***interpretation of spectra*** and applications for identification and structure determination.

UNIT V

NMR: Theory, instrumentation, chemical shift, shielding and deshielding effects, splitting of signals, spin-spin coupling, proton exchange reactions, coupling constant(J), nuclear overhauser effect (NOE), ^{13}CNMR spectra and its applications, 2D-NMR, COSY and applications in pharmacy.

REFERENCES:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
4. A Text book of Pharmaceutical Analysis by Kerrenth A. Connors
5. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
6. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
7. Organic Chemistry by I. L. Finar
8. Organic spectroscopy by William Kemp
9. Quantitative Analysis of Drugs by D. C. Garrett
10. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
11. Spectrophotometric identification of Organic Compounds by Silverstein
12. HPTLC by P.D. Seth
13. Indian Pharmacopoeia 2007
14. High Performance thin layer chromatography for the analysis of medicinal plants by Eike Reich, Anne Schibli
15. Introduction to instrumental analysis by Robert. D. Braun

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Analysis)
PHARMACEUTICAL AND FOOD ANALYSIS (Professional Core – II)

Course Objective: This course is designed to impart knowledge on analysis of food constituents and finished food products. The course includes application of instrumental analysis in the determination of pesticides in variety of food products.

Course Outcome: At completion of this course student shall be able to understand various analytical techniques in the determination of

- Food constituents
- Food additives
- Finished food products
- Pesticides in food
- Pharmaceuticals (API & Dosage forms)
- And also student shall have the knowledge on food regulations and legislations

UNIT - I

a. **Carbohydrates:** Classification and properties of food carbohydrates, General methods of analysis of food carbohydrates,
b. **Proteins**: Chemistry and classification of amino acids and proteins, Physico-Chemical properties of protein and their structure, general methods of analysis of proteins and amino acids

UNIT - II

a. **Lipids:** Classification, general methods of analysis, refining of fats and oils; hydrogenation of vegetable oils, Determination of adulteration in fats and oils.

b. **Vitamins:** Classification of vitamins, methods of analysis of vitamins, Principles of microbial assay of vitamins of B-series

UNIT - III

Probiotics: Definition, history, importance, mode of action, identification advantages and disadvantages of probiotics. Applications of Probiotics

UNIT - IV

Definition, classification and principles and procedures involved in the quantitative determination of drugs from each category of both API and dosage forms (IP) of the following

a. Analgesics & Antipyretics
b. Antihypertensives
c. Antihistamines
d. Alkaloids
e. Antibiotics
f. Diuretics

UNIT - V

a. **General Analytical methods** for milk, milk constituents and milk products like ice cream, milk powder, butter, margarine, cheese including adulterants and contaminants of milk.
b. **Analysis of fermentation products** like wine, spirits, beer and vinegar.
    - Pesticides in food
    - And also student shall have knowledge in food regulations and legislations

TEXT BOOKS:

1. The chemical analysis of foods – David Pearson, Seventh edition, Churchill Livingstone, Edinburgh London, 1976

2. Introduction to the Chemical analysis of foods – S. Nielsen, Jones & Bartlett publishers, Boston London, 1994.
3. Official methods of analysis of AOAC International, sixth edition, Volume I & II, 1997.
4. Analysis of Food constituents – Multon, Wiley VCH.
5. Dr. William Horwitz, Official methods of analysis of AOAC International
6. 18th edition, 2005.Theory and Practice of Industrial Pharmacy by Lieberman and Lachman

REFERENCE BOOKS:

1. Remington's Pharmaceutical Sciences by Alfonso and Gennaro
2. David Pearson. The Chemical Analysis of Foods, 7th ed., Churchill Livingstone, Edinburgh, 1976.
3. Nielsen S. Introduction to the chemical analysis of foods. Jones & Bartlett Publishers, Boston, 1974
4. Indian Pharmacopoeia 2012

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Analysis)

ADVANCED PHARMACEUTICAL ANALYSIS (Professional Elective - I)

Course Objective: The principles and procedures for the determination of various pharmaceutical bulk drugs and their formulations belonging to different categories are discussed in detail. The applications of the important reagents like MBTH, FC, PDAB etc. in the determination of the pharmaceuticals are also discussed.

Course Outcome: The quantitative determination of various organic compounds is clearly understood. The spectral analysis, dissolution parameters and microbial assays are also learned.

UNIT I

Principles and procedures involved in the determination of the official compounds in IP with the following analytical techniques

A. Non-aqueous
B. Oxidation-reduction
C. Complexometric
D. Diazotization methods
E. Neutralization
F. Acid – Base

UNIT II

A detailed study of the principles and procedures involved in the quantitative determination of the following organic functional groups

A. Amines
B. Esters
C. Carbonyl compounds
D. Hydroxy and carboxyl
E. Amino Acids

UNIT III

a. Reference Standards: Types, preparation methods and uses.

b. Principles and procedures involved in using the following reagents in the determination of pharmaceutical dosage forms official in IP

a. MBTH (3-methyl-2-benzothiazolone hydrazone)
b. F.C. Reagent (Folin-Ciocalteu)
c. PDAB (*para*-Dimethyl Amino Benzaldehyde)
d. 2, 3, 5 - *tri*Phenyltetrazolium salt
e. 2,6 *di* -ChloroquinoneChlorimide
f. *N* - (1-naphthyl) ethylenediaminedihydrochloride (B.M. Reagent)
g. Carr – Price Reagent
h. 2,4 - DNP

UNIT - IV

a. Analysis of Excipients: Tests related to excipients such as bulk density, tapped density, particle size distribution, pH, moisture content, viscosity (dynamic), loss on drying, ash content, conductivity.

b. Excipients of interest: Disintegrating agents, binders, emulsifiers, viscosity modifiers and preservatives including preservative challenge test.

UNIT-V

a. **Dissolution Tests:** Types of Dissolution apparatus, dissolution test requirements for immediate release, delayed release, extended release dosage forms, coated, uncoated, enteric coated, gelatin capsules etc.

b. **Microbiological assays and Biological tests:** Antimicrobial effectiveness testing, microbial limit tests, sterility test. Antibiotics-microbial assays, bacterial endotoxins test.

TEXT BOOKS:

1. Pharmaceutical Chemistry by Becket and Stanlake
2. Pharmaceutical Analysis by Higuchi, Bechmman and Hassan
3. Instrumental Methods of Chemical Analysis By B.K. Sharma
4. A Text Book of Pharmaceutical Analysis by Kennenth A. Conners
5. Organic spectroscopy by Y.R Sharma Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
6. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.

REFERENCES:

1. Remington's Pharmaceutical Sciences by Alfonso and Gennaro
2. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P.D. Sethi
3. Indian Pharmacopoeia 2010
4. Journals (Indian Drugs, IJPS etc.)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Analysis)

DRUG REGULATORY AFFAIRS (Professional Elective - I)

Course Objective: The topics which are present in the Drug regulatory affairs are very much useful which increases the knowledge regarding the regulatory aspects in the pharmaceutical industries.

Course Outcome:

- Students will come to know the different competent regulatory authorities globally.
- Students be aware of technical aspects pertaining to the marketing authorization application (MAA)
- The regulatory guidelines and directions framed by the regulatory authorities will be helpful to place the drug products in market for marketing approvals.

UNIT I

Drug Regulatory Aspects (India)

1. Indian drug regulatory authorities, Central and State regulatory bodies (FDA)
2. Drugs and Cosmmetics Act and Rules with latest Amendments (Selective)
3. Special emphasis – Schedule M and Y
4. New drugs – Importation, Registration, development, Clinical Trials, BE NOC & BE studies
5. Various Licences – Test Lic., Import lic., for testing of drugs and API's, Manufacturing Contract and Loan licence manufacturing.

UNIT II

Good Manufacturing Practices (GMP)

1. Indian GMP certification, WHO GMP certification.
2. ICH guidelines for stability testing and other relevant ones (Q1-Q10)
3. Export permissions and manufacturing for semi-regulated countries
4. Understanding of the plant layouts with special emphasis on the environment & safety (HVAC, Water Systems, Stores Management, Effluent etc.)
5. Quality Assurance and Qulaity Control – Basic understanding for in-built quality.

UNIT III

A detailed study of regulatory aspects that affect drug product design, manufacture and distribution in a developed country such as USA and in a developing country such as Brazil, Hatch Waxmann Act; Bolar Provisions and other FDA Regulations. Regulatory aspects of pharmaceutical and bulk drug manufacture, regulatory drug analysis.

UNIT IV

Documentation related to manufacturing, cleaning methods, retention samples and records, quality control, batch release documents, distribution records, complaints and recalls.
Quality, safety and legislation for cosmetic products and herbal products.

UNIT V

Governing Regulatory Bodies across the globe.

Country Authority Submission

a. U.S Food & Drug Administration USDMF
b. Canada Therapeutic Product Directorate DMF
c. Europe
   1) European Medicines Agency (EMEA/ National Authorities) EDMF
   2) European Directorate for Quality of Medicines CEP/COS & Health Care Products.

3) MHRA – Medicines and Health Care Products Regulatory Agency

d. Product Filing
e. Responding Regulatory Deficiencies
f. Final Approval Procedure

Preparation, review and submission of Drug Master Files to Regulatory Authorities as per their specific requirements.

TEXT AND REFERENCE BOOKS:

1. Original laws published by Govt. of India.
2. Text Book of Forensic Pharmacy by Mithal B. M.; Vallabh Prakashan, New Delhi.
3. Laws of Drugs in India by Hussain.
4. Text Book of Forensic Pharmacy by Jain N. K.; Vallabh Prakashan, New Delhi.
5. Pharmaceutical Regulatory Affairs - Selected Topics, CVS Subramanyam and J Thimmasetty, Vallabh Prakashan Delhi - 2013

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Analysis)

PHYTOCHEMISTRY (Professional Elective - I)

Course Objective: Helps the students to get exposed to natural product drug discovery and to perform quantitative and qualitative evaluation of herbal extracts. To understand the chemistry of important phyto consitituents of different categories.

Course Outcome: On the basis of chemistry data of phytoconstituents students will acquire knowledge on various types of phytoconstituents present in the plants.

UNIT I

Biosynthetic pathways and Radio tracing techniques: containing drugs:

a) Methods of Biogenetic Investigations, detailed study of isotropic tracer techniques.
b) Study of Biosynthetic pathways of of following phyto-pharmaceuticals: Atropine, Morphine, Cardiac glycosides and Flavonoids.

UNIT II

Drug discovery and development: Approaches to discovery and development of natural products as potential new drugs. Sourcing and archiving Natural products for discovery, evaluating natural products for therapeutic properties, Identifying the biologically active Natural products, the lead structure selection process and Optimization with suitable examples from the following source: artemesin, andrographolides.

UNIT III

a) Extraction/Isolation methods for specific Phytochemical groups, Choice of solvents and Interfering compounds for general Isolation and purification of desired phytoconstituents.
b) Recent sophisticated extraction techniques like: Super critical fluid extraction and Ultra-sonic extraction. Separation of phytoconstituents by Vacuum and Flash column chromatography.

UNIT IV

Sources, Chemical structure, Identification tests, mechanism of action SAR, uses of the following phyto-pharmaceuticals:

a) Atropine, caffeine, Morphine and brief account on its derivatives and analogues
b) Camptothecin, Digoxin
c) Taxol, Podophyllotoxin

UNIT V

a. Natural colorants: Biological Source, colouring principles, chemical nature and usage of the following Annatto, Cochineal, Caramel, Henna, Indigo, Madder, Saffron, Turmeric
b. Flavours and Perfumes: Sandal wood oil, Orange oil, Lemon oil, Palmarosa oil, Geranium oil.

Reference books

1. Phytochemical methods of chemical analysis by Harbone
2. Modern methods of plant analysis- peach & M.V. Tracey Vol. 1 to VII
3. Pharmacognosy & Phytochemistry of medical plants by Jean Brunton
4. Thin layer chromatography by Stahl
5. Chemistry of natural products by Atur Rahman
6. Comprehensive Medicinal Chemistry, Vol 1-6, Elsevier Publication
7. Medicinal Chemistry Drug Discovery by Donald J, Abrahm,
8. Plant drug analysis by Wagner

9. Clarke's isolation & identification of drugs by AC Mottal
10. Chromatography of Alkaloids by Varpoorte Swendson
11. Jenkins Quantitative pharmaceutical chemistry by AN Kenwell
12. Standardization of botanicals by V. Rajpal Vol 1 & 2
13. Medicinal chemistry and drug discovery by Burger's
14. Foye's Principles of medicinal chemistry.
15. Pharmacognosy and phytochemistry by Biren seth
16. Herbal Perfumes and cosmetics by Panda
17. Herbal Drug Technology by SS Agarwal
18. Pharmacognosy and Phytochemistry by VD Rangari.
19. Textbook of Pharmacognosy by G.E. Trease, W.C.Evans, ELBS

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Kommula Vill, Vijayapuri Colony,
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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Analysis)

QUALITY CONTROL AND QUALITY ASSURANCE (Professional Elective - II)

Course Objective: This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It covers the important aspects like cGMP, QC tests, documentation, quality certifications, GLP and regulatory affairs.

Course Outcome: Upon completion of this course the student should be able to

- Understand the cGMP aspects in a pharmaceutical industry
- To appreciate the importance of documentation
- To understand the scope of quality certifications applicable to
- Pharmaceutical industries
- To understand the responsibilities of QA & QC departments.

UNIT – I

Introduction: Concept and evolution and scopes of Quality Control and Quality Assurance, Good Laboratory Practice, GMP, Overview of ICH Guidelines - QSEM, with special emphasis on Qseries guidelines. Good Laboratory Practices: Scope of GLP, Definitions, Quality assurance unit, protocol for conduct of non-clinical testing, control on animal house, report preparation and documentation. CPCSEA guidelines.

UNIT - II

cGMP guidelines according to schedule M, USFDA (inclusive of CDER and CBER) Pharmaceutical Inspection Convention (PIC), WHO and EMEA covering: Organization and personnel responsibilities, training, hygiene and personal records, drug industry location, design, construction and plant lay out, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination and Good Warehousing Practice.

UNIT - III

Analysis of raw materials, finished products, packaging materials, in process quality control (IPQC), Developing specification (ICH Q6 and Q3), purchase specifications and maintenance of stores for raw materials. In process quality control and finished products quality control for following dosage forms in Pharma industry according to Indian, US and British pharmacopoeias: tablets, capsules, ointments, suppositories, creams, parenterals, ophthalmic and surgical products (How to refer pharmacopoeias).

UNIT - IV

Documentation in pharmaceutical industry: Three tier documentation, Policy, Procedures and Work instructions, and records (Formats), Basic principles- How to maintain, retention and retrieval etc. Standard operating procedures (How to write), Master Batch Record, Batch Manufacturing Record, Quality audit plan and reports. Specification and test procedures, Protocols and reports. Distribution records. Electronic data handling. Concepts of controlled and uncontrolled documents. Submission documents for regulators DMFs, as Common Technical Document and Electronic Common Technical Documentation (CTD, eCTD). Concept of regulated and non-regulated markets.

UNIT - V

Manufacturing operations and controls: Sanitation of manufacturing premises, mix-ups and cross contamination, processing of intermediates and bulk products, packaging operations, IPQC, release of finished product, process deviations, charge-in of components, time limitations on production, drug product inspection, expiry date calculation, calculation of yields, production record review, change control, sterile products, aseptic process control, packaging, reprocessing, salvaging, handling of

waste and scrap disposal. Introduction, scope and importance of intellectual property rights. Concept of trade mark, copyright and patents.

REFERENCE BOOKS:

1. Quality Assurance Guide by organization of Pharmaceutical Procedures of India, 3rd revised edition, Volume I & II, Mumbai, 1996.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69, Marcel Dekker Series, 1995.
3. Quality Assurance of Pharmaceuticals- A compedium of Guide lines and Related materials Vol I & II, 2nd edition, WHO Publications, 1999.
4. How to Practice GMP's – P P Sharma, Vandana Publications, Agra, 1991.
5. The International Pharmacopoeia – vol I, II, III, IV & V - General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excepients and Dosage forms, 3rd edition, WHO, Geneva, 2005.
6. Good laboratory Practice Regulations – Allen F. Hirsch, Volume 38, Marcel Dekker Series, 1989.
7. ICH guidelines
8. ISO 9000 and total quality management
9. The drugs and cosmetics act 1940 – Deshpande, Nilesh Gandhi, 4th edition, Susmit Publishers, 2006.
10. QA Manual – D.H. Shah, 1st edition, Business Horizons, 2000.
11. Good Manufacturing Practices for Pharmaceuticals a plan for total quality control – Sidney H. Willig, Vol. 52, 3rd edition, Marcel Dekker Series.
12. Steinborn L. GMP/ISO Quality Audit Manual for Healthcare Manufacturers and Their Suppliers, Sixth Edition, (Volume 1 - With Checklists and
13. Software Package). Taylor & Francis; 2003.
14. Sarker DK. Quality Systems and Controls for Pharmaceuticals. John Wiley & Sons; 2008.
15. Packaging of Pharmaceuticals.
16. Schedule M and Schedule N.

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Kommula Vill, Vijayapuri Colony,
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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Analysis)

COSMETICS AND COSMECEUTICALS (Professional Elective - II)

Course Objectives: Upon completion of the course, the students shall be able to understand

- Key ingredients used in cosmetics and cosmeceuticals.
- Key building blocks for various formulations.
- Current technologies in the market
- Various key ingredients and basic science to develop cosmetics and cosmeceuticals
- Scientific knowledge to develop cosmetics and cosmeceuticals with desired Safety, stability, and efficacy.

Course Outcomes: Upon completion of the subject student shall able to know Regulatory biological aspects of cosmetics, excipients used for various formulations, designing of cosmeceuticals and herbal products

UNIT I

Cosmetics – Regulatory: Definition of cosmetic products as per Indian regulation. Indian regulatory requirements for labeling of cosmetics Regulatory provisions relating to import of cosmetics. Misbranded and spurious cosmetics. Regulatory provisions relating to manufacture of cosmetics – Conditions for obtaining license, prohibition of manufacture and sale of certain cosmetics, loan license, offences and penalties.

UNIT II

Cosmetics - Biological aspects: Structure of skin relating to problems like dry skin, acne, pigmentation, prickly heat, wrinkles and body odor. Structure of hair and hair growth cycle. Common problems associated with oral cavity. Cleansing and care needs for face, eye lids, lips, hands, feet, nail, scalp, neck, body and under-arm.

UNIT III

Formulation Building blocks: Building blocks for different product formulations of cosmetics/cosmeceuticals. Surfactants – Classification and application. Emollients, rheological additives: classification and application. Antimicrobial used as preservatives, their merits and demerits. Factors affecting microbial preservative efficacy. Building blocks for formulation of a moisturizing cream, vanishing cream, cold cream, shampoo and toothpaste. Soaps and syndetbars.
Perfumes; Classification of perfumes. Perfume ingredients listed as allergens in EU regulation.
Controversial ingredients: Parabens, formaldehyde liberators, dioxane.

UNIT IV

Design of cosmeceutical products: Sun protection, sunscreens classification and regulatory aspects. Addressing dry skin, acne, sun-protection, pigmentation, prickly heat, wrinkles, body odor., dandruff, dental cavities, bleeding gums, mouth odor and sensitive teeth through cosmeceutical formulations.

UNIT V

Herbal Cosmetics: Herbal ingredients used in Hair care, skin care and oral care. Review of guidelines for herbal cosmetics by private bodies like cosmos with respect to preservatives, emollients, foaming agents, emulsifiers and rheology modifiers. Challenges in formulating herbal cosmetics.

REFERENCES

1. Harry's Cosmeticology. 8th edition.
2. Poucher's perfume cosmetics and Soaps, 10th edition.
3. Cosmetics - Formulation, Manufacture and quality control, P. P. Sharma, 4th edition
4. Handbook of cosmetic science and Technology A.O. Barel, M. Paye and H.I. Maibach. 3 rd edition
5. Cosmetic and Toiletries recent suppliers' catalogue.
6. CTFA directory.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Analysis)

STABILITY OF DRUGS AND DOSAGE FORMS (Professional Elective – II)

Course Objective: These topics are designed impart a specialized knowledge to preserve the properties of drugs and dosage forms during manufacture storage and shelf life. The understanding of properties and evaluation of stability during storage, by solution and solid state against several factors of degradation.

Course Outcome: The students should describe the evaluation of stability of solutions, solids and formulations against adverse conditions. The students should be able to suggest the measures to retain stability and storage conditions for retaining the efficacy of the products.

UNIT - I

Drug decomposition mechanisms:

1. Hydrolysis and acyltransfers: Nature of reaction, structure and utility, stabilization of Pharmaceutical examples.
2. Oxidation: Nature of oxidation, kinetics of oxidation, oxidation pathways of pharmaceutical, Interest Inhibition of oxidation
3. Photolysis: Energetics of photolysis, kinetics photolysis, photolytic reactions of pharmaceutical interest, prevention of photolytic reactions.

UNIT - II

Solid state chemical decomposition: Kinetic of solids state decomposition, Pharmaceutical examples of solid-state decomposition, Pure drugs, drug excipient and drug-drug interaction in solid state, methods of stabilization.

Physical stability testing of dosage forms:

1. Solids – tablets, capsules, powder and granules
2. Disperse systems
3. Microbial decomposition
4. Over-view, physical stability of novel drug carriers, liposomes, niosomes, nano-particles.

UNIT - III

Identification and quantitative determination of preservatives, Antioxidants, colouring materials, emulsifiers and stabilizers in Pharmaceutical formulation.

Analysis of drugs from biological samples including, selection of biological sample, extraction of drugs by various methods as LLE, SPE and Membrane filtration. Factors affecting extraction of drugs.

UNIT - IV

General method of analysis to determine the quality of raw materials used in cosmetic industry. Indian Standard Specifications (ISI) laid down for sampling and testing of various cosmetics in finished form by the Bureau of Indian Standards.

UNIT - V

Methods of analysis to determine the quality of cosmetics in the finished forms such as Hair care products, Skin care products, Baby care products, Dental products, Personal hygiene products, Colour cosmetics, Ethnic products, Colour makeup preparation, Lipsticks, Hair setting lotions and Eye shadows. Toxicity testing in cosmetics and Safety and Legislation of Cosmetic products.

Stability studies: Concept of stability studies.

a) cGMP& ICH guidelines for Accelerated stability Testing.

b) Interaction of containers & closure Compatibility Testing.

REFERENCE BOOKS:

1. Comprehensive Pharmacy Review 5th Edition by Leon Shargel, Alan H. Mutnick, Paul F. Souney, Larry N. Sawnson – 2004.
2. A. H. Beckett and J. B. Stenlake Practical Pharmaceutical Chemistry, Part I and Part II, 4th Edition. 3. G. H. Jeffery, J. Basset, J. Mendham, R. C. Denny (Rev. by) Vogels Text Book of Quantitative Chemical Analysis, 5th Edition 1989, ELBS.
3. The Controller of Publications; New Delhi, Govt. of India, Indian Pharmacopoeia, Vol. I and Vol. II - 2010.
4. J. B. Wilkinson and R. J. Moore, Herry's Cosmeticology; Longman Scientific and Technical Publishers, Singapore.
5. P.D. Sethi; Quantitative Analysis of Drugs in Pharmaceutical Formulations, 3rd Edition - 1997,
6. Classification of cosmetics raw materials and adjuncts IS 3958 of Indian Standards Institution (BIS).
7. Cosmetic and toilet goods – methods of sampling IS 3958 of Indian Standards Institution (BIS).
8. Methods of sampling and test for various cosmetics as laid down by Bureau of Indian Standards.
9. Drug stability: Principles and practices by Jens T. Carstensen
10. Stability Testing of Drug Products by W. Grimm. 12. Stability of Drugs and Dosage Forms by Yoshioka and Stella.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Analysis)

RESEARCH METHODOLOGY AND IPR

Course Objectives:

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

Course Outcomes: At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT - I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT - II

Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT - III

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT - IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT - V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

REFERENCES:

1. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
2. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
3. Mayall, “Industrial Design”, McGraw Hill, 1992.
4. Niebel, “Product Design”, McGraw Hill, 1974.
5. Asimov, “Introduction to Design”, Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New
7. Technological Age”, 2016.
8. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Analysis)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES LAB (Laboratory – I)

LIST OF EXPERIMENTS:

1. Colorimetry / UV / Visible, Spectroscopy, scanning of few compounds for UV-absorption, calculation of Assay / content uniformity / % of drug release (2-3 experiments.)
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiment base on HPLC (Isocratic and gradient) Techniques – (2 experiments)
4. Incompatibility studies, identification and functional groups – Determination by FTIR (2 experiments)
5. Separation and calculation of Rf values by using paper chromatography, TLC, HPTLC Technique (2-3 experiments)
6. Calibration of glasswares
7. Calibration of pH meter
8. Calibration of UV-Visible spectrophotometer
9. Calibration of FTIR spectrophotometer
10. Calibration of HPLC instrument

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Analysis)

PHARMACEUTICAL FOOD ANALYSIS LAB (Laboratory – II)

LIST OF EXPERIMENTS:

1. Determination of total reducing sugar
2. Determination of proteins
3. Determination of saponification value, Iodine value, Peroxide value, Acid value in food products
4. Determination of fat content and rancidity in food products
5. Analysis of natural and synthetic colors & food additives in food
6. Determination of preservatives in food
7. Determination of pesticide residue in food products
8. Assay of any two Analgesic & Antipyretic drugs (API & dosage forms) official in IP
9. Assay of any two Antihistamines (API & dosage forms) official in IP
10. Assay of any two Diuretics (API & dosage forms) official in IP
11. Microbiological assay of any two Antibiotics official in IP

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Analysis)

ADVANCED INSTRUMENTAL ANALYSIS – I (Professional Core - III)

Course Objectives: This subject deals with various hyphenated analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are LC-MS, GC-MS, and hyphenated techniques.

Course Outcome: By the completion of topics the students will come out with the thorough knowledge of various spectral aspects of X-Ray, IR, SEM, ORD etc which help them in further projects works and also industrial opportunities.

UNIT - I

X-Ray diffraction methods: Origin of X-rays, basic aspects of crystals, X-ray crystallography, miller indices, rotating crystal techniques, single crystal diffraction, powder diffraction, structural elucidation and applications.

UNIT - II

a. **Biochromatography:** Size exclusion chromatography, ion exchange chromatography, ion pair chromatography, affinity chromatography general principles, stationary phases and mobile phases.
b. **Super critical fluid chromatography**: Principles, instrumentation, pharmaceutical applications.

UNIT-III

Capillary Electrophoresis: Overview of CE in pharmaceutical analysis, basic configuration, CE characteristics, principles of CE, methods and modes of CE. General considerations and method development in CE,

UNIT - IV

a. **DSC:** Principle, thermal transitions, instrumentation (Heat flux and power- compensation designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, Sources of errors) and their influence, advantages and disadvantages, pharmaceutical applications.
b. **DTA**: Principle, instrumentation, advantage and disadvantage, pharmaceutical application, derivative differential thermal analysis (DDTA).
c. **TGA:** Principle, instrumentation, factors affecting results, advantages and disadvantages, pharmaceutical application.

UNIT - V

Scanning electron microscope (**SEM**): Principles, Instrumentation and applications.
Optical Rotatory Dispersion (ORD), Circular Dichroism, Cotton effect, Octane rule and applications.

REFERENCES:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. A Text book of Pharmaceutical Analysis by Kerrenth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett

9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein
11. HPTLC by P.D. Seth

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Analysis)

MODERN BIO-ANALYTICAL TECHNIQUES (Professional Core - IV)

Course Objectives: This subject is designed to provide detailed knowledge about the importance of analysis of drugs in biological matrices.

Course Outcomes: Upon completion of the course, the student shall be able to understand

- Extraction of drugs from biological samples
- Separation of drugs from biological samples using different techniques
- Guidelines for BA/BE studies

UNIT I

Extraction of drugs and metabolites from biological matrices: General need, principle and procedure involved in the Bioanalytical methods such as Protein precipitation, Liquid -Liquid extraction and Solid phase extraction and other novel sample preparation approach.

UNIT II

Biopharmaceutical Consideration: Introduction, Biopharmaceutical Factors Affecting Drug Bioavailability, In Vitro: Dissolution and Drug Release Testing, Alternative Methods of Dissolution Testing Transport models, Biopharmaceutics Classification System. Solubility: Experimental methods. Permeability: In-vitro, in-situ and In-vivo methods.

UNIT III

Bioanalysis and bioanalytical method validation:

a. Types of body fluids, requirement of analysis, matrix effects, non-biological analytical samples.
b. Bioanalytical method validation: USFDA and EMEA guidelines. Acceptance criteria in comparison to non-biological samples.

UNIT IV

Pre-Formulation: A consideration of following characteristics of medicinal agents in their dosage form:

Physical characteristics - Particle size, polymorphism, crystal form, solubility, Interfacial tension, Salt formation, wetting of solids, flow characteristics, compressibility and Partition coefficient.

Chemical Characteristics - Degradation: Hydrolytic, oxidative, reductive and photolytic, Drug – Excipient compatibility studies.

UNIT V

a. Automation and computer-aided analysis, LIMS: The concept of auto samplers and high throughput analysis, computer-controlled instrumentation and networked laboratory. Peculiarities of laboratory information management systems (LIMS).
b. Drug Product Performance, In Vivo: Purpose of Bioavailability Studies, Bioavailability and Bioequivalence Studies.

REFERENCES

1. Analysis of drugs in Biological fluids - Joseph Chamberlain, 2nd Edition. CRC Press, New York. 1995.
2. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Pharmaceutical Analysis - Higuchi, Brochmman and Hassen, 2nd Edition, Wiley – Interscience Publications, 1961.

4. Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11, Marcel Dekker Series
5. Practical HPLC method Development – Snyder, Kirkland, Glaich, 2nd Edition, John Wiley & Sons, New Jercy. USA.
6. Chromatographic Analysis of Pharmaceuticals – John A Adamovics, 2nd Edition, Marcel Dekker, New York, USA. 1997.
7. Chromatographic methods in clinical chemistry & Toxicology – Roger L Bertholf, Ruth E Winecker, John Wiley & Sons, New Jersey, USA. 2007.
8. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol.69, Marcel Dekker Series, 1995.
9. Good laboratory Practice Regulations – Allen F. Hirsch, Volume 38, Marcel Dekker Series, 1989.
10. ICH, USFDA & CDSCO Guidelines
11. Palmer

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Analysis)

PHARMACEUTICAL VALIDATION (Professional Elective - III)

Course Objective: The main purpose of the subject is to understand about validation and how it can be applied to industry and thus to improve the quality of the products. The subject covers the complete information about validation, types, methodology and application.

Course Outcome: Upon completion of the subject student shall be able to

- Explain the aspect of validation
- Carryout validation of manufacturing processes
- Apply the knowledge of validation to instruments and equipments

UNIT I

Introduction: Definition of Qualification and Validation, Advantage of Validation, Streamlining of Qualification & Validation process and Validation Master Plan.

Qualification: User Requirement Specification, Design Qualification, Factory Acceptance Test (FAT)/ Site Acceptance Test (SAT), Installation Qualification, Operational Qualification, Performance Qualification, Re- Qualification (Maintaining status -Calibration Preventive Maintenance, Change management), Qualification of Manufacturing Equipment, Qualification of Analytical Instruments and Laboratory equipments.

UNIT II

Qualification of analytical instruments: Electronic balance, pH meter, UV-Visible spectrophotometer, FTIR, GC, HPLC, HPTLC

Qualification of Glassware: Volumetric flask, pipette, Measuring cylinder, beakers and burette.

UNIT III

Qualification of laboratory equipments: Hardness tester, Friability test apparatus, tap density tester, Disintegration tester, Dissolution test apparatus.

Validation of Utility systems: Pharmaceutical water system & pure steam, HVAC system, Compressed air and nitrogen.

UNIT IV

Cleaning Validation: Cleaning Validation - Cleaning Method development, Validation and validation of analytical method used in cleaning. Cleaning of Equipment. Cleaning of Facilities. Cleaning in place (CIP).

UNIT V

Analytical method validation: General principles, Validation of analytical method as per ICH guidelines and USP.

- Validate the manufacturing facilities

REFERENCES:

1. T. Loftus & R. A. Nash, "Pharmaceutical Process Validation", Drugs and Pharm Sci. Series, Vol. 129, 3rd Ed., Marcel Dekker Inc., N.Y.
2. The Theory & Practice of Industrial Pharmacy, 3rd edition, Leon Lachman, Herbert A. Lieberman, Joseph. L. Karig, Varghese Publishing House, Bombay.
3. Validation Master plan by Terveeks or Deeks, Davis Harwood International publishing.

4. Validation of Aseptic Pharmaceutical Processes, 2nd Edition, by Carleton & Agalloco, (Marcel Dekker).
5. Michael Levin, Pharmaceutical Process Scale-Upll, Drugs and Pharm. Sci. Series, Vol. 157, 2nd Ed., Marcel Dekker Inc., N.Y.
6. Validation Standard Operating Procedures: A Step by Step Guide for Achieving Compliance in the Pharmaceutical, Medical Device, and Biotech Industries, Syed Imtiaz Haider
7. Pharmaceutical Equipment Validation: The Ultimate Qualification Handbook, Phillip A. Cloud, Interpharm Press
8. Validation of Pharmaceutical Processes: Sterile Products, Frederick J.Carlton (Ed.) and James Agalloco (Ed.), Marcel Dekker, 2nd Ed.
9. Analytical Method validation and Instrument Performance Verification by Churg Chan, Heiman Lam

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Analysis)

HERBAL COSMETICS (Professional Elective - III)

Course Objective: The topics helps the students to get exposed to processes involved in the manufacturing of herbal cosmetics including the skin and hair care herbal products preparation and their evaluation.

Course Outcome: Students will learn about the raw materials used in herbal cosmetics and get exposed to various preparations of herbal cosmetics.

UNIT I

Introduction: Herbal/ natural cosmetics, Classification & Economic aspects.
Regulatory Provisions relation to manufacture of cosmetics: -
License, GMP, offences & Penalties, Import & Export of Herbal/natural cosmetics, Industries involved in the production of Herbal/natural cosmetics.

UNIT II

a) Commonly used herbal cosmetics raw materials –water, preservatives, surfactants, oils /waxes, colors, and some functional herbs
b) Processes used in the manufacture of cosmetics-Emulsification, Mixing, compaction, Molding, Packing.
c) General principles of quality control of herbal cosmetics

UNIT III

Skin care Products: Physiology and chemistry of skin, Method of preparation, pharmaceutical and Pharmacological evaluation procedures for various formulations like Creams, Lotions, Lipsticks, Face packs. Elaborative study of five formulations under each category with regard to their composition and claims for various herbs used in them.

UNIT IV

Hair care Products: Hair structure and its chemistry
Method of preparation, pharmaceutical and Pharmacological evaluation procedures for various formulations like Hair dyes, Creams, Oils and Shampoos. Elaborative study of five formulations under each category with regard to their composition and claims for various herbs used in them.

UNIT V

Herbs in cosmetics:
A brief account of following herbals or herb extracts or herbal products of cosmetic importance such as Acacia concinna pods, Aloe Vera, Almond oil, Neem, Citrus aurantium peels, Henna, Turmeric, Liquorices, Olive oil, tea tree oil and wheat germ oil with special emphasis on their source, active principles and cosmetic properties.

REFERENCES:

1. Cosmetics- Formulation, Manufacturing and Quality control –P.P. Sharma
2. Herbal Cosmetics Hand Book- H. Panda
3. Herbal Cosmetics by P.K Chattopadhyay
4. The Complete Technology Book on Herbal Perfumes and Cosmetics by H. Panda

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm. I Year II Sem (Pharmaceutical Analysis)

PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS (Professional Elective - III)

Course Objective: This course enables students to understand various pharmacoepidemiological methods and their clinical applications. Also, it aims to impart knowledge on basic concepts, assumptions, terminology, and methods associated with Pharmacoeconomics and health related outcomes, and when should be appropriate Pharmacoeconomic model should be applied for a health care regimen.

Course Outcome: Upon completion of this course it is expected that students shall be able to:

- Understand the various epidemiological methods and their applications
- Understand the fundamental principles of Pharmacoeconomics.
- Identify and determine relevant cost and consequences associated with pharmacy products and services.
- Perform the key Pharmacoeconomics analysis methods
- Understand the Pharmacoeconomic decision analysis methods and its applications.
- Describe current Pharmacoeconomic methods and issues.
- Understand the applications of Pharmacoeconomics to various pharmacy settings.

UNIT - I

Introduction to Pharmacoepidemiology: Definition, Scope, Need, Aims & Applications; Outcome measurement: Outcome measures, Drug use measures: Monetary units, Number of prescriptions, units of drug dispensed, defined daily doses, prescribed daily doses, Diagnosis and Therapy surveys, Prevalence, Incidence rate, Monetary units, number of prescriptions, unit of drugs dispensed, defined daily doses and prescribed daily doses, medications adherence measurements. Concept of risk: Measurement of risk, Attributable risk and relative risk, Time- risk relationship and odds ratio

UNIT - II

Pharmacoepidemiological Methods: Qualitative models: Drug Utilization Review; Quantitative models: case reports, case series, Cross sectional studies, Cohort and case control studies, Calculation of Odds' ratio, Meta-analysis models, Drug effects study in populations: Spontaneous reporting, Prescription event monitoring, Post marketing surveillance, Record linkage systems, Applications of Pharmacoepidemiology

UNIT - III

Introduction to Pharmacoeconomics: Definition, history of Pharmacoeconomics, Need of Pharmacoeconomic studies in Indian healthcare system. Cost categorization and resources for cost estimation: Direct costs. Indirect costs. Intangible costs. Outcomes and Measurements of Pharmacoeconomics: Types of outcomes: Clinical outcome, Economic outcomes, Humanistic outcomes; Quality Adjusted Life Years, Disability Adjusted Life Years Incremental Cost-Effective Ratio, Average Cost-Effective Ratio. Person Time, Willingness to Pay, Time Trade Off and Discounting.

UNIT - IV

Pharmacoeconomic evaluations: Definition, Steps involved, Applications, Advantages and disadvantages of the following Pharmacoeconomic models: Cost Minimization Analysis (CMA),Cost Benefit Analysis (CBA), Cost Effective Analysis (CEA), Cost Utility Analysis (CUA), Cost of Illness (COI), Cost Consequences Analysis (COA).

UNIT - V

Definition, Steps involved, Applications, Advantages and disadvantages of the following:

Health related quality of life (HRQOL): Definition, Need for measurement of HRQOL, Common HRQOL measures. Definition, Steps involved, Applications of the following: Decision Analysis and Decision tree, Sensitivity analysis, Markov Modeling, Software used in Pharmacoeconomic analysis, Applications of Pharmacoeconomics.

REFERENCES:

1. Rascati K L. Essentials of Pharmacoeconomics, Woulters Kluwe rLippincott Williams & Wilkins, Philadelphia.
2. Thomas E Getzen. Health economics. Fundamentals and Flow of Funds. John Wiley & Sons, USA.
3. Andrew Briggs, Karl Claxton, Mark Sculpher. Decision Modeling for Health Economic Evaluation, Oxford University Press, London.
4. K G Revikumar, Pharmacoepidemiology and Pharmacoeconomics Concepts and Practices.
5. Michael Drummond, Mark Sculpher, George Torrence, Bernie O'Brien and Greg Stoddart. Methods for the Economic Evaluation of Health Care Programs Oxford University Press, London.
6. George E Mackinnon III. Understanding health outcomes and Pharmacoeconomics.
7. Graker, Dennis. Pharmacoeconomics and outcomes.
8. Walley, Pharmacoeconomics.
9. Pharmacoeconomic – ed. by Nowakowska – University of Medical Sciences, Poznan.
10. Relevant review articles from recent medical and pharmaceutical literature
11. Guru Prasad Mohanta and P K Manna, Textbook of Pharmacovigilance Concepts and Practice

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm Sem – II (PHARMACEUTICAL ANALYSIS)

ADVANCED INSTRUMENTAL ANALYSIS – II (Professional Elective - IV)

Course Objectives: This subject deals with various hyphenated analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are LC-MS, GC-MS, and hyphenated techniques.

Course Outcome: By the completion of topics the students will come out with the thorough knowledge of various electrochemical methods, flourimetry, AAS, RIA, ELISA etc. which help them in further projects works and also industrial opportunities

UNIT- I

Polarography – Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications.

Amperometry - Principles, instrumentation and applications including amperometric titrations.

UNIT- II

a. **Potentiometry –** Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.
b. **Conductometry–** Introduction, Conductivity cell, Conductometric titrations, applications

UNIT- III

Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence (Characteristics of drugs that can be analyzed by flourimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.

UNIT - IV

Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.

UNIT - V

a. **Radio chemical methods including RIA:** Radio Active Isotopes, tagging of compounds, Labeled Reagents, Isotope dilution Analysis, Scintillation counter, RIA.
b. **ELISA:** Principle, types and application of ELISA

REFERENCES:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. A Text book of Pharmaceutical Analysis by Kerrenth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein
11. HPTLC by P.D. Seth

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Analysis)

NUTRACEUTICALS (Professional Elective - IV)

Course Objectives: The students will expose to characteristic features of various phytochemicals as nutraceuticals in various diseased conditions and also know the role of antioxidant in free radical induced disease conditions and will expose to various food laws and regulations

Course Outcome: Helps the student to understand the importance of Nutraceuticals in various common problems with the concept of free radicals

UNIT - I

a. Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer etc.
b. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods:
Spirulina, Soya bean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds

UNIT - II

Phytochemicals as nutraceuticals: Occurrence and characteristic features (chemical nature medicinal benefits) of following

a. Carotenoids- α and β-Carotene, Lycopene, Xanthophylls, lutein
b. Sulfides: Diallylsulfides, Allyltrisulfide.
c. Polyphenolics: Reservetrol
d. Flavonoids- Rutin, Naringin, Quercitin, Anthocyanidins, catechins, Flavones
e. Prebiotates / Probiotics.: Fructo oligosaccharides, Lacto bacillum
f. Phytoestrogens, Isoflavones, daidzein, Geebustin, lignans
g. Tocopherols

UNIT - III

a. Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids.
b. Measurement of free radicals: Lipid peroxidation products, lipid hydroperoxide, malondialdehyde.

UNIT - IV

a. Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals involvement in other disorders. Free radicals theory of ageing.
b. Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E, α-Lipoic acid, melatonin
c. Synthetic antioxidants: Butylatedhydroxy Toluene, Butylatedhydroxy Anisole.

UNIT - V

Food Laws and Regulations; FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods.
Regulations and Claims – Current Products: Label Claims, Nutrient Content Claims, Health Claims, Dietary Supplements Claims

REFERENCES:

1. Dietetics by Sri Lakshmi
2. Role of dietary fibres and nutraceuticals in preventing diseases by K. T Agusti and P. Faizal: BS Publication.
3. Advanced Nutritional Therapies by Cooper. K.A., (1996).
4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).
5. Prescription for Nutritional Healing by James F. Balch and Phyllis A. Balch 2nd Edn., Avery Publishing Group, NY (1997).
6. G. Gibson and C. Williams Editors *2000 Functional foods* Woodhead Publ. Co. London.
7. Goldberg, I. *Functional Foods*. 1994. Chapman and Hall, New York.
8. Labuza, T.P. 2000 Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in *Essentials of Functional Foods* M. K. Sachmidl and T.P. Labuza eds. Aspen Press.
9. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition)
10. Shils, ME, Olson, JA, Shike, M. 1994 *Modern Nutrition in Health and Disease*. Eighth edition. Lea and Febiger

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Princeton College of Pharmacy,
Kommula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist.,Telangana.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Analysis)

CLINICAL RESEARCH AND PHARMACOVIGILANCE (Professional Elective - IV)

Course Objective: This subject will provide a value addition and current requirement for the students in clinical research and pharmacovigilance. It will teach the students on conceptualizing, designing, conducting, managing and reporting of clinical trials. This subject also focuses on global scenario of pharmacovigilance in different methods that can be used to generate safety data. It will teach the students in developing drug safety data in pre-clinical, clinical phases of drug development and post market surveillance.

Course Outcomes: Upon completion of the course, the student shall be able to,

- Explain the regulatory requirements for conducting clinical trial
- Demonstrate the types of clinical trial designs
- Explain the responsibilities of key players involved in clinical trials
- Execute safety monitoring, reporting and close-out activities
- Explain the principles of Pharmacovigilance
- Detect new adverse drug reactions and their assessment
- Perform the adverse drug reaction reporting systems and communication in pharmacovigilance

UNIT- I

Regulatory Perspectives of Clinical Trials: Origin and Principles of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines Ethical Committee: Institutional Review Board, Ethical Guidelines for Biomedical Research and Human Participant-Schedule Y, ICMR, Informed Consent Process: Structure and content of an Informed Consent Process Ethical principles governing informed consent process

UNIT - II

Clinical Trials: Types and Design: Experimental Study- RCT and Non RCT, Observation Study: Cohort, Case Control, Cross sectional Clinical Trial Study Team Roles and responsibilities of Clinical Trial Personnel: Investigator, Study Coordinator, Sponsor, Contract Research Organization and its management.

UNIT- III

Clinical Trial Documentation: Guidelines to the preparation of documents, Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study Report Clinical Trial Monitoring-Safety Monitoring in CT Adverse Drug Reactions: Definition and types. Detection and reporting methods. Severity and seriousness assessment. predictability and preventability assessment. Management of adverse drug reactions; Terminologies of ADR.

UNIT- IV

Basic aspects, terminologies and establishment of pharmacovigilance: History and progress of pharmacovigilance, Significance of safety monitoring, Pharmacovigilance in India and international aspects, WHO international drug monitoring programme, WHO and Regulatory terminologies of ADR, evaluation of medication safety, establishing pharmacovigilance centres in Hospitals, Industry and National programmes related to pharmacovigilance. Roles and responsibilities in Pharmacovigilance.

UNIT- V

Methods, ADR reporting and tools used in pharmacovigilance: International classification of diseases, International Nonproprietary names for drugs, Passive and Active surveillance,

Comparative observational studies, targeted clinical investigations and Vaccine safety surveillance. Spontaneous reporting system and Reporting to regulatory authorities, Guidelines for ADRs reporting. Argus, Aris G Pharmacovigilance, Vigi Flow, Statistical methods for evaluating medication safety data.

REFERENCES:

1. Central Drugs Standard Control Organization- Good Clinical Practices, Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
2. International Conference on Harmonization of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonized Tripartite Guideline. Guideline for Good Clinical Practice. E6; May 1996.230
3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
5. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
6. Handbook of clinical Research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone.
7. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
8. Textbook of Pharmacovigilance: Concept and Practice. G. P. Mohanta and P. K. Manna. 2016, Pharma Med Press.
9. A textbook of Clinical Pharmacy Practice: Essential Concepts and Skills. Second Edition, 2012, University Press

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Analysis)

ADVANCED INSTRUMENTAL ANALYSIS LAB (Laboratory – III)

List of Experiments

1. Determination of chlorides and sulphates by Nephelo -Tubmidimetry
2. Determination of compounds of sodium, potassium and calcium by Flame photometry.
3. Estimation of riboflavin/quinine sulphate by flourimetry
4. Assay of official compounds by potentiometric titrations **(Any 2)**
5. Assay of official compounds by conductimetric titrations **(Any 2)**
6. Demonstration on ELISA
7. Quenching of fluorescence
8. Perform phosphate interference on absorption of calcium

(Note: Minimum of two experiments covering each of the above-mentioned topics)

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Analysis)

MODERN BIOANALYTICAL TECHNIQUES LAB (Laboratory – IV)

List of Experiments:

1. Biomolecules separation utilizing various sample preparation techniques and quantitative analysis of components by gel electrophoresis
2. Biomolecules separation utilizing various sample preparation techniques and quantitative analysis of components by HPLC techniques.
3. Isolation of analgesics from biological fluids (blood serum and urine)
4. Protocol preparation and performance of bioanalytical method validation
5. Identification of anti-histaminics drug in urine by TLC
6. Extraction of drugs and metabolites from biological matrices by SPE/LLE
7. HPLC separation of modern drug from plasma and its formulations (Diclofenac)
8. Stability indicating method development by HPLC of any API

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm II Year I Sem (Pharmaceutical Analysis)

BIOSTATISTICS (Professional Elective - V)

Course Objective: The student shall know the introduction, scope of biostatistics and Research work, calculation and present of the data.

Course Outcome: The student will be known the Biostatistics arrangement, presentation and formation of tables and charts. They also know the correlation and regression & application of different methods, analysis of data

UNIT - I
Introduction and scope of biostatistics: Use of statistics in Pharmacy. Population and Sample collection. Stages of research, types of data and methods of data collections. Data arrangement and presentation, formation of table and charts.

UNIT - II
Measures of central tendency: computation of means, median and mode from grouped and ungrouped data.
Measure of dispersion: computation of variance, standard deviation, standard error and their coefficients.

UNIT - III
Measures of Correlation and Regression
Probability rules: Binomial, Poison and Normal distribution.

UNIT - IV
Experimental designing, planning of an experiment, replication and randomization.
Analysis of Variance (ANOVA): 1-way, 2- Way

UNIT - V
Hypothesis testing: Student 't' test, Chi square test,
Non- Parametric Tests: Sign Test, Sign Rank Test, Wilcoxon Sign Rank Test

REFERENCE BOOKS:

1. Statistics for business and economics 3rd edition by Vikas books publications
2. Biostatistics & Computer applications by GN Rao and NK Tiwari
3. Sokal, R.R. and Rohlf, F.J. 1987. An Introduction to Biostatistics. W.H. Freeman and Company.
4. Bailey, N.T.J. 1981. Statistical Methods in Biology. English University Press.
5. Mitchell, K. and Glover, T. 2001. Introduction to Biostatistics. McGraw Hill, Publishing Co.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm II Year I Sem (Pharmaceutical Analysis)
SCALE UP AND TECHNOLOGY TRANSFER (Professional Elective - V)

Course Objective: This course is designed to impart knowledge and skills necessary to train the students to be on scale up, technology transfer process and industrial safety issues.
Course Outcome: On completion of this course it is expected that students will be able to;

- Manage the scale up process in pharmaceutical industry.
- Assist in technology transfer.
- To establish safety guidelines, which prevent industrial hazards.

UNIT I
Pilot plant design: Basic requirements for design, facility, equipment selection, for tablets, capsules, liquid orals, parentral and semisolid preparations.
Scale up: Importance, Technology transfer from R & D to pilot plant to plant scale, process scale up for tablets, capsules, liquid orals, semisolids, parentral, NDDS products – stress on formula, equipments, product uniformity, stability, raw materials, physical layout, input, in-process and finished product specifications, problems encountered during transfer of technology

UNIT II
Validation: General concepts, types, procedures & protocols, documentation, VMF. Analytical method validation, cleaning validation and vender qualification.

UNIT III
Equipment Qualification: Importance, IQ, OQ, PQ for equipments – autoclave, DHS, membrane filter, rapid mixer granulator, cone blender, FBD, tablet compression machine, liquid filling and sealing machine. Aseptic room validation.

UNIT IV
Process validation: Importance, validation of mixing, granulation, drying, compression, tablet coating, liquid filling and sealing, sterilization, water process systems, environmental control.

UNIT V
Industrial safety: Hazards – fire, mechanical, electrical, chemical and pharmaceutical, Monitoring & prevention systems, industrial effluent testing & treatment. Control of environmental pollution.

REFERENCES:

1. Pharmaceutical process validation, JR Berry, Nash, Vol 57, Marcel Dekker, NY.
2. Pharmaceutical Production facilities, design and applications, by GC Cole, Taylor and Francis.
3. Pharmaceutical project management, T. Kennedy, Vol 86, Marcel Dekker, NY.
4. The theory & Practice of Industrial Pharmacy, L. Lachman, H.A. Lieberman, Varghese Publ Bombay.
5. Tablet machine instruments in pharmaceuticals, PR Watt, John Wiloy.
6. Pharmaceutical dosage forms, Tablets, Vol 1, 2, 3 by Lachman, Lieberman, Marcel Dekker, NY.
7. Pharmaceutical dosage forms, Parentral medications, Vol 1, 2 by K.E. Avis, Marcel Dekker, NY.
8. Dispersed system Vol 1, 2, 3 by Lachman, Lieberman, Marcel Dekker, NY.
9. Subrahmanyam, CVS, Pharmaceutical production and Management, 2007, Vallabh Prakashan, Dehli.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm II Year I Sem (Pharmaceutical Analysis)
PRODUCTION AREA DESIGN & PACKAGING DEVELOPMENT (Professional Elective - V)

Course Objectives: The student shall learn about Industrial area design, Current good manufacturing practices. They also learn about packaging components, polymers and metals used in packaging. They also understand about the storage conditions of different formulations and their stability evaluations.

Course Outcome: At the end of the semester student will get an idea about Industrial area design and packaging of different formulations and its stability conditions.

UNIT - I
Production Area Design: Selection of plant location, Design of plant for bulk drugs and formulations (Solids, Semisolids, Injectables, Nutraceuticals etc.), General utilities such as purified water, portable water, water for injection, Air handling units-Relative humidity and Temperature control, Material and personnel movement. Warehouse handling-API, Excipients, packaging materials and solvents.

UNIT - II
Current Good Manufacturing Practices: GMP design for buildings & facilities. GMP layout design. Clean room classifications. Segregation & cross contamination control. HVAC (heating, ventilation & air-conditioning) systems. Clean room environment control. Documentation and record keeping: Specifications and testing procedures, Specifications for finished products, Master Formulae, Packaging instructions. Batch processing records, Standard operating procedures.

UNIT - III
Pharmaceutical packaging and Design: Introduction, Packaging system, Components of packaging, Symbols used on packages and labels. Package development and Design research. Packaging materials- Polymers and Plasters, Glass, Metal and Blister and strip packaging.

UNIT - IV
Stability of Packaging: Introduction, Legislation, Regulation, Pharmaceutical Stability Testing in Climatic Cabinets, Pharmaceutical Stability Testing Conditions, Photo-Stability Testing, Review of Pharmaceutical Product Stability, Packaging and the ICH Guidelines.

UNIT - V
Packaging of Solids, Semisolids, Parenterals, Ophthalmic and Aerosols: Introduction, Packaging of Solid and semisolids, Packaging of Sterile Pharmaceuticals, Packaging Components, Inspection of Filled Injectable Products, Storage and Labelling, Packaging of Ophthalmics, Selection of Packaging Materials, Packaging of Aerosols.

REFERENCES:

1. Leon Lachman; Lieberman Herbert A.; Kanig, Joseph L. The theory and Practice of Industrial Pharmacy.
2. Gilbert Banker and Christopher Rhodes. Modern Pharmaceutics.
3. Aulton's Pharmaceutics: The design and Manufacture of Medicine
4. D. A. Dean, Roy Evans, Ian Hall. Pharmaceutical packaging technology. Tylor and Francis.
5. Edward J. Bauer, Pharmaceutical Packaging Handbook. Bausch and Lomb, Rochester, New York, USA.
6. Wilmer A. Jenkins, Kenton R. Osborn. Packaging drugs and pharmaceuticals.
7. Remington: The Science and Practice of Pharmacy. 8. Michael E. Aulton, Kevin Tylor

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Analysis)

ENGLISH FOR RESEARCH PAPER WRITING (Audit Course - I & II)

Prerequisite: None

Course objectives: Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

UNIT-I:
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-II:
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-III:
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV:
key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT-V:
skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

TEXT BOOKS/ REFERENCES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Analysis)

DISASTER MANAGEMENT (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches,
- planning and programming in different countries, particularly their home country or the countries they work in

UNIT-I:

Introduction:

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India:

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-II:

Repercussions of Disasters and Hazards:

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III:

Disaster Preparedness and Management:

Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-IV:

Risk Assessment Disaster Risk:

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT-V:

Disaster Mitigation:

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

TEXT BOOKS/ REFERENCES:

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “’New Royal book Company.
2. Sahni, Pardeep Et. Al. (Eds.),” Disaster Mitigation Experiences and Reflections”, Prentice Hall of India, New Delhi.
3. Goel S. L., Disaster Administration and Management Text and Case Studies”, Deep &Deep Publication Pvt. Ltd., New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Analysis)

SANSKRIT FOR TECHNICAL KNOWLEDGE (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Course Outcomes: Students will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

UNIT-I:
Alphabets in Sanskrit,

UNIT-II:
Past/Present/Future Tense, Simple Sentences

UNIT-III:
Order, Introduction of roots,

UNIT-IV:
Technical information about Sanskrit Literature

UNIT-V:
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TEXT BOOKS/ REFERENCES:

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Analysis)

VALUE EDUCATION (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

Course outcomes: Students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality

UNIT-I:
Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

UNIT-II:
Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

UNIT-III:
Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

UNIT-IV:
Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT-V:
Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation, Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

TEXT BOOKS/ REFERENCES:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Analysis)

CONSTITUTION OF INDIA (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

UNIT-I:
History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working), **Philosophy of the Indian Constitution:** Preamble**,** Salient Features.

UNIT-II:
Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality**,** Right to Freedom**,** Right against Exploitation**,** Right to Freedom of Religion**,** Cultural and Educational Rights**,** Right to Constitutional Remedies, Directive Principles of State Policy**,** Fundamental Duties.

UNIT-III:
Organs of Governance: Parliament**,** Composition**,** Qualifications and Disqualifications**,** Powers and Functions**,** Executive**,** President**,** Governor**,** Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

UNIT-IV:
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT-V:
Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

TEXT BOOKS/ REFERENCES:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Analysis)

PEDAGOGY STUDIES (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Course Outcomes: Students will be able to understand:

- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

UNIT-I:

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

UNIT-II:

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT-III:

Evidence on the effectiveness of pedagogical practices, Methodology for the indepth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the scho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT-IV:

Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT-V:

Research gaps and future directions: Research design**,** Contexts**,** Pedagogy**,** Teacher education**,** Curriculum and assessment**,** Dissemination and research impact.

TEXT BOOKS/ REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.

4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Analysis)

STRESS MANAGEMENT BY YOGA (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To achieve overall health of body and mind
- To overcome stress

Course Outcomes: Students will be able to:

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

UNIT-I:
Definitions of Eight parts of yog. (Ashtanga)

UNIT-II:
Yam and Niyam.

UNIT-III:
Do`s and Don't's in life.
i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT-IV:
Asan and Pranayam

UNIT-V:
i) Various yog poses and their benefits for mind & body
ii) Regularization of breathing techniques and its effects-Types of pranayam

TEXT BOOKS/ REFERENCES:

1. 'Yogic Asanas for Group Tarining-Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Analysis)

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS
(Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Course Outcomes: Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

UNIT-I:

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

UNIT-II:

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-III:

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT-IV:

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

UNIT-V:

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

TEXT BOOKS/ REFERENCES:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.PHARMACY (PHARMACEUTICAL REGULATORY AFFAIRS)

R19 COURSE STRUCTURE AND SYLLABUS
Effective from Academic Year 2019-20 Admitted Batch

I YEAR I Semester

Course Code	Course Title	L	T	P	Credits
Professional Core-I	Good Regulatory Practice	3	0	0	3
Professional Core-II	Drug Regulatory Affairs	3	0	0	3
Professional Elective-I	1. Intellectual Property Rights 2. Total Quality Management 3. Pharmaceutical Validation	3	0	0	3
Professional Elective-II	1. Stability of Drugs and Dosage forms 2. Pharmaceutical Formulation Technology 3. Documentation and Regulatory Writing	3	0	0	3
	Research methodology and IPR	2	0	0	2
Laboratory- I	Regulatory Practice and Documentation Lab	0	0	4	2
Laboratory- II	Drug Regulation and Registration Lab	0	0	4	2
Audit - I	Audit Course - I	2	0	0	0
	Total	**16**	**0**	**8**	**18**

I YEAR II Semester

Course Code	Course Title	L	T	P	Credits
Professional Core-III	Regulatory aspects of medical devices	3	0	0	3
Professional Core-IV	Regulatory aspects of herbals and biologicals	3	0	0	3
Professional Elective-III	1. Regulatory aspects of food and Nutraceuticals 2. Biostatistics and Research Methodology 3. Nano based Drug delivery systems	3	0	0	3
Professional Elective-IV	1. Clinical research and Pharmacovigilance 2. Nutraceuticals 3. Advanced Drug Delivery Systems	3	0	0	3
Laboratory- III	Regulatory aspects of herbals and biologicals Lab	0	0	4	2
Laboratory- IV	Regulatory aspects of medical devices Lab	0	0	4	2
	Mini Project with Seminar	2	0	0	2
Audit - II	Audit Course - II	2	0	0	0
	Total	**16**	**0**	**8**	**18**

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II YEAR I Semester

Course Code	Course Title	L	T	P	Credits
Professional Elective-V	1. Analytical Method validation 2. Pharmaceutical Industry Management 3. Pharmaceutical Production technology	3	0	0	3
Open Elective	Open Elective	3	0	0	3
Dissertation	Dissertation Work Review - II	0	0	12	6
	Total	**6**	**0**	**12**	**12**

II YEAR II SEMESTER

Course Code	Course Title	L	T	P	Credits
Dissertation	Dissertation Work Review - III	0	0	12	6
Dissertation	Dissertation Viva-Voce	0	0	28	14
	Total	**0**	**0**	**40**	**20**

***For Dissertation Work Review - I, Please refer 7.8 in R19 Academic Regulations.**

Audit Courses I & II:

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technological Learning
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Regulatory Affairs)

GOOD REGULATORY PRACTICE (Professional Core - I)

Course Objective: This course is designed to impart fundamental knowledge on various Good Regulatory Practices viz., cGMP, GLP, GALP and GDP for Pharmaceuticals, Cosmetics, Food & Nutraceuticals, Medical devices, In-vitro Diagnostic Medical Devices (IVDs) and biological products and understand the rationale behind these requirements and will propose ways and means of complying with them.

Course Outcome: At completion of this course it is expected that students will be able to understand

- The key regulatory and compliance elements with respect to Good Manufacturing Practices, Good Laboratory Practices, Good Automated Laboratory Practices and Good Documentation Practices.
- Prepare and implement the check lists and SOPs for various Good Regulatory Practices.
- Implement Good Regulatory Practices in the Healthcare and related Industries.
- Prepare for the readiness and conduct of audits and inspections.

UNIT - I
Current Good Manufacturing Practices: Introduction, US Cgmp Part 210 and Part 211.EC Principles of GMP (Directive 91/356/EEC) Article 6 to Article 14 and WHO cGMP guidelines GAMP-5; Medical device and IVDs Global Harmonization Task Force (GHTF) Guidance docs.

UNIT - II
Good Laboratory Practices: Introduction, USFDA GLP Regulations (Subpart A to Subpart K), Controlling the GLP inspection process, Documentation, Audit, goals of Laboratory Quality Audit, Audit tools, Future of GLP regulations, relevant ISO and Quality Council of India (QCI) Standards

UNIT - III
Good Automated Laboratory Practices: Introduction to GALP, Principles of GALP, GALP Requirements, SOPs of GALP, Training Documentation,21 CFR Part 11, General check list of 21CFR Part 11, Software Evaluation checklist, relevant ISO and QCI Standards.

UNIT - IV
Good Distribution Practices: Introduction to GDP, Legal GDP requirements put worldwide, Principles, Personnel, Documentation, Premises and Equipment, Deliveries to Customers, Returns, Self-Inspection, Provision of information, Stability testing principles, WHO GDP, USP GDP (Supply chain integrity), relevant CDSCO guidance and ISO standards

UNIT - V
Quality management systems: Concept of Quality, Total Quality Management, Quality by design, Six Sigma concept, Out of Specifications (OOS), Change control. Validation: Types of Validation, Types of Qualification, Validation master plan (VMP), Analytical Method Validation. Validation of utilities, [Compressed air, steam, water systems, Heat Ventilation and Air conditioning (HVAC)]and Cleaning Validation. The International Conference on Harmonization (ICH) process, ICH guidelines to establish quality, safety and efficacy of drug substances and products, ISO 13485, Sch MIII and other relevant CDSCO regulatory guidance documents.

TEXT AND REFERENCE BOOKS:

1. Good Laboratory Practice Regulations, by Sandy Weinberg, Fourth Edition Drugs and the Pharmaceutical Sciences, Vol.168

1. Good Pharmaceutical Manufacturing practice, Rational and compliance by John Sharp, CRC Press
2. Establishing a cGMP Laboratory Audit System, A practical Guide by David M. Bleisner, Wiley Publication.
3. How to practice GLP by PP Sharma, Vandana Publications.
4. Laboratory Auditing for Quality and Regulatory compliance bu Donald C. Singer, Drugs and the Pharmaceutical Sciences, Vol.150.
1. Drugs & Cosmetics Act, Rules & Amendments

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Regulatory Affairs)

DRUG REGULATORY AFFAIRS (Professional Core - II)

Course Objectives: The topics which are present in the Drug regulatory affairs are very much useful which increases the knowledge regarding the regulatory aspects in the pharmaceutical industries.

Course Outcomes:

- Students will come to know the different competent regulatory authorities globally.
- Students be aware of technical aspects pertaining to the marketing authoritization application (MAA)
- The regulatory guidelines and directions framed by the regulatory authorities will be helpful to place the drug products in market for marketing approvals.

UNIT - I

Drug Regulatory Aspects (India)

1. Indian drug regulatory authorities, Central and State regulatory bodies (FDA)
2. Drugs and Cosmmetics Act and Rules with latest Amendments (Selective)
3. Special emphasis – Schedule M and Y
4. New drugs – Importation, Registration, development, Clinical Trials, BE NOC & BE studies
5. Various Licences – Test Lic., Import lic., for testing of drugs and API's, Manufacturing Contract and Loan licence manufacturing.

UNIT - II

Good Manufacturing Practices (GMP)

1. Indian GMP certification, WHO GMP certification.
2. ICH guidelines for stability testing and other relevant ones (Q1-Q10)
3. Export permissions and manufacturing for semi-regulated countries
4. Understanding of the plant layouts with special emphasis on the environment & safety. (HVAC, Water Systems, Stores Managemant, Effluent etc.)
5. Quality Assurance and Qulaity Control – Basic understanding for in-built quality.

UNIT - III

A detailed study of regulatory aspects that affect drug product design, manufacture and distribution in a developed country such as USA and in a developing country such as Brazil, Hatch Waxmann Act; Bolar Provisions and other FDA Regulations. Regulatory aspects of pharmaceutical and bulk drug manufacture, regulatory drug analysis.

UNIT - IV

Documentation related to manufacturing, cleaning methods, retention samples and records, quality control, batch release documents, distribution records, complaints and recalls.
Quality, safety and legislation for cosmetic products and herbal products.

UNIT - V

Governing Regulatory Bodies across the globe.

Country Authority Submission

a. U.S Food & Drug Administration USDMF
b. Canada Therapeutic Product Directorate DMF
c. Europe
    1) European Medicines Agency (EMEA/ National Authorities) EDMF
    2) European Directorate for Quality of Medicines CEP/COS & Health Care Products.

3) MHRA – Medicines and Health Care Products Regulatory Agency

d. Product Filing
e. Responding Regulatory Deficiencies
f. Final Approval Procedure

Preparation, review and submission of Drug Master Files to Regulatory Authorities as per their specific requirements.

TEXT AND REFERENCE BOOKS

1. Original laws published by Govt. of India.
2. Text Book of Forensic Pharmacy by Mithal B. M.; Vallabh Prakashan, New Delhi.
3. Laws of Drugs in India by Hussain.
4. Text Book of Forensic Pharmacy by Jain N. K.; Vallabh Prakashan, New Delhi.
5. Pharmaceutical Regulatory Affairs - Selected Topics, CVS Subramanyam and J Thimmasetty, Vallabh Prakashan Delhi - 2013

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Regulatory Affairs)

INTELLECTUAL PROPERTY RIGHTS (Professional Elective - I)

Course Objective: Various types of Intellectual Property Rights Patentable Subject History of Indian Patent Protection, Patent filing procedure in India, Opposition- pre-grant opposition and post-grant opposition, Patent filing procedure under PCT, advantages, patent search and literature and Salient features of Indian Patents are discussed in detail.

Course Outcome: The clear information about the patent laws, intellectual property rights and drug regulation in India and abroad is gained by the students.

UNIT - I

Introduction, Types of Intellectual Property Rights (Patents, Trademarks, Copyrights, Geographical Indications Industrial Designs and Trade secrets), Patentable Subject Matter (Novelty, Non- Obviousness, Utility, enablement and Best mode),

UNIT - II

a. History of Indian Patent Protection, Rationale behind Patent System, Objectives and Advantages of Patent System, and future challenges. Indian Patents Act 1970, Definitions and Key Terminology, Types of Patent applications, Inventions not patentable (section 3 and 4).
b. Patent filing procedure in India (Patent Prosecution), Specifications (Provisional and Complete), Claims- types of claims and legal importance of claims, Grant of patent, Rights of Patentee and co-owners
c. Opposition - pre-grant opposition and post-grant opposition, Anticipation, Infringement, Compulsory Licensing, revocation of patents, and power of Controller.
d. Patent filing procedure under PCT, advantages, patent search and literature

UNIT - III

a. Salient features of Indian Patents (Amendments) Act 1999, 2002 and 2005. US and European Patent System,
b. Background, Salient Features and Impact of International Treaties / Conventions like
    1. Paris Convention, Berne convention
    2. World Trade Organization (WTO)
    3. World Intellectual Property Organization (WIPO)
    4. Trade Related Aspects of Intellectual Property Rights (TRIPS)
    5. Patent Co-operation Treaty (PCT), Madrid Protocol

UNIT - IV

a. PCT Application procedure and review procedure
b. National phase application procedure for US& EU
c. Patent prosecution procedure in US and EU
d. WIPO and its role in IPR
e. Hatch- Waxman provision for IPR

UNIT - V

a. Patent in validation process in India, US and Europe
b. IPR related to copyright, trade mark, trade secret and geographical indication.
c. Patent application writing
d. Claim construction and claims.

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RECOMMENDED BOOKS:

1. Research Methodology concepts and cases by Depak Chawla, Neena Sondhi
2. Draft manual of Patent Practice and Procedure -2008, The Patent Office, India
3. Manual of Patent Office Practice and Procedure -2010
4. Original Laws Published by Govt. of India
5. Protection of Industrial Property rights by P. Das and Gokul Das
6. Law and Drugs, Law Publications by S.N. Katju
7. Laws of drugs in India, Hussain
8. New drug approval process, 5th edition, by Guarino
9. Commercial Manual on Drugs and Cosmetics 2004, 2nd edition
10. Drugs and Cosmetics act by Vijay Malik
11. Good Manufacturing Practices for Pharmaceuticals, S.H. Wiling, Vol. 78, Marcel Decker.
12. fda.org, wipo.int, patentlawlinks.com, hc-sc.gc.ca, ich.org, cder.org
13. Current good manufacturing practices for pharmaceuticals by Manohar A. Potdar
14. Pharmaceutical Regulatory affairs –selected topics. CVS subhramanyam and J Thimma settee. Delhi, Vallabh Prakashan, 2012

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Regulatory Affairs)

TOTAL QUALITY MANAGEMENT (Professional Elective - I)

Course Objectives: Total quality management constitutes very useful chapter like –good manufacturing practices, GLP, GCP, ICH etc. Which increases the knowledge of students in various quality control & regulatory aspects.

Course Outcomes: Total quality management helps the students to learn the established regulatory guidelines in GMP, GCP, GLP, USFDA, WHO, ISO etc to become a perfect budding pharmacist. It is very useful to students to acquire vast knowledge regarding the quality control aspects of different regulatory bodies as per their requirements throughout the world.

UNIT - I
Concepts and Philosophy of TQM, GLP, GMP (orange guide).

UNIT – II
Drug regulatory and accrediting agencies of the world (USFDA, TGA, ICH, WHO, ISO etc.)

UNIT - III
Good manufacturing practices: Organization and personnel, responsibilities, training, hygiene. Premises: Location, design, plant layout, construction, maintenance and sanitation, environmental control, utilities and services like gas, water, maintenance of sterile areas, control of contamination. Equipments: Selection, purchase specifications, maintenance, clean-in-place, sterilize-in-place, methods (TP and STP). Raw materials: Purchase specifications, maintenance of stores, selection of vendors, controls on raw materials and finished dosage forms. Manufacture of and controls on dosage forms: Manufacturing documents, master formula, batch formula records, standard operating procedures, quality audits of manufacturing processes and facilities. In process quality controls on various dosage forms; sterile and non–sterile, standard operating procedures for various operations like cleaning, filling, drying, compression, coating, disinfections, sterilization, membrane filtration etc., Packaging and labelling control, line clearance, reconciliation of labels, cartons and other packaging materials. Quality Control Laboratory: Responsibilities, good laboratory practices, routine controls instruments, reagents, sampling plans, standard test procedures, protocols, non-clinical testing, controls on animal house. Data generation and storage, quality control documents, retention samples, records and audits of quality control facilities. Finished products release, quality review, quality audits, batch release document.

UNIT - IV
Regulatory Considerations for Pre-clinical and Clinical Evaluation: Pre-clinical requirements currently in use. Regulatory requirements of single dose and repeat dose toxicity studies. Study of specific toxicities such as mutagenicity, carcinogenicity and teratoginicity. Animal pharmacokinetics and toxicokinetics. Regulatory requirements of clinical evaluation, pharmacokinetics in man genetic polymorphism. Design and interpretation of clinical trials. Quality assurance standards as per ISO.

UNIT - V
Globalization of drug industry, present status and scope of pharmaceutical industry in India. WHO and NABL certification, ICH guidelines for manufacturing and quality assurance of drug formulation.

TEXT AND REFERENCE BOOKS:

1. Guidelines for Developing National Drug Policies; WHO Publications, 1998.

2. Quality Assurance of Pharmaceuticals–A Compendium of Guidelines and Related Materials, Vol.–1; WHO Publications.
3. A Guide to Total Quality Management by Kaushik Maitra and Sedhan K. Ghosh.
4. GMP by Mehra.
5. How to Practice GMP by P.P. Sharma.
6. ISO 9000 and Total Quality Management by Sadhan K. Ghosh.
7. Good Manufacturing Practices for Pharmaceuticals-A Plan for Total Quality Control by Sidney H. Willing & James R Stoker. (Drugs & Pharm. Sciences) Vol. 78; Marcel Dekker Inc.
8. OPPI-Quality Assurance, USP.
9. Current good manufacturing practices for pharmaceuticals by Manohar A. Potdar
10. Quality assurance and quality management in pharmaceutical industry by Y. Anjaneyulu and marayya
11. Total Quality Management, An integrated Approach by D. R. Kiran, BS Publications
12. Total Quality Management, 3rd edition by Joel E. Ross. CRC press

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Regulatory Affairs)

PHARMACEUTICAL VALIDATION (Professional Elective - I)

Course Objective: The main purpose of the subject is to understand about validation and how it can be applied to industry and thus to improve the quality of the products. The subject covers the complete information about validation, types, methodology and application.

Course Outcome: Upon completion of the subject student shall be able to

- Explain the aspect of validation
- Carryout validation of manufacturing processes
- Apply the knowledge of validation to instruments and equipments

UNIT - I

Introduction: Definition of Qualification and Validation, Advantage of Validation, Streamlining of Qualification & Validation process and Validation Master Plan.

Qualification: User Requirement Specification, Design Qualification, Factory Acceptance Test (FAT)/ Site Acceptance Test (SAT), Installation Qualification, Operational Qualification, Performance Qualification, Re- Qualification (Maintaining status -Calibration Preventive Maintenance, Change management), Qualification of Manufacturing Equipment, Qualification of Analytical Instruments and Laboratory equipments.

UNIT - II

Qualification of analytical instruments: Electronic balance, pH meter, UV-Visible spectrophotometer, FTIR, GC, HPLC, HPTLC

Qualification of Glassware: Volumetric flask, pipette, Measuring cylinder, beakers and burette.

UNIT - III

Qualification of laboratory equipments: Hardness tester, Friability test apparatus, tap density tester, Disintegration tester, Dissolution test apparatus.

Validation of Utility systems: Pharmaceutical water system & pure steam, HVAC system, Compressed air and nitrogen.

UNIT - IV

Cleaning Validation: Cleaning Validation - Cleaning Method development, Validation and validation of analytical method used in cleaning. Cleaning of Equipment. Cleaning of Facilities. Cleaning in place (CIP).

UNIT - V

Analytical method validation: General principles, Validation of analytical method as per ICH guidelines and USP.

- Validate the manufacturing facilities

REFERENCES:

1. T. Loftus & R. A. Nash, "Pharmaceutical Process Validation", Drugs and Pharm Sci. Series, Vol. 129, 3rd Ed., Marcel Dekker Inc., N.Y.
2. The Theory & Practice of Industrial Pharmacy, 3rd edition, Leon Lachman, Herbert A. Lieberman, Joseph. L. Karig, Varghese Publishing House, Bombay.
3. Validation Master plan by Terveeks or Deeks, Davis Harwood International publishing.

4. Validation of Aseptic Pharmaceutical Processes, 2nd Edition, by Carleton & Agalloco, (Marcel Dekker).
5. Michael Levin, Pharmaceutical Process Scale-Upll, Drugs and Pharm. Sci. Series, Vol. 157, 2nd Ed., Marcel Dekker Inc., N.Y.
6. Validation Standard Operating Procedures: A Step by Step Guide for Achieving Compliance in the Pharmaceutical, Medical Device, and Biotech Industries, Syed Imtiaz Haider
7. Pharmaceutical Equipment Validation: The Ultimate Qualification Handbook, Phillip A. Cloud, Interpharm Press
8. Validation of Pharmaceutical Processes: Sterile Products, Frederick J.Carlton (Ed.) and James Agalloco (Ed.), Marcel Dekker, 2nd Ed.
9. Analytical Method validation and Instrument Performance Verification by Churg Chan, Heiman Lam

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Regulatory Affairs)

STABILITY OF DRUGS AND DOSAGE FORMS (Professional Elective - II)

Course Objectives: These topics are designed impart a specialized knowledge to preserve the properties of drugs and dosage forms during manufacture storage and shelf life. The understanding of properties and evaluation of stability during storage, by solution and solid state against several factors of degradation.

Course Outcomes: The students should describe the evaluation of stability of solutions, solids and formulations against adverse conditions. The students should be able to suggest the measures to retain stability and storage conditions for retaining the efficacy of the products.

UNIT - I
Drug decomposition mechanisms:

1. Hydrolysis and acyltransfers: Nature of reaction, structure and utility, stabilization of Pharmaceutical examples.
2. Oxidation: Nature of oxidation, kinetics of oxidation, oxidation pathways of pharmaceutical, Interest Inhibition of oxidation
3. Photolysis: Energetics of photolysis, kinetics photolysis, photolytic reactions of pharmaceutical interest, prevention of photolytic reactions.

UNIT - II
Solid state chemical decomposition: Kinetic of solids state decomposition, Pharmaceutical examples of solid-state decomposition, Pure drugs, drug excipient and drug-drug interaction in solid state, methods of stabilization.
Physical stability testing of dosage forms:

1. Solids – tablets, capsules, powder and granules
2. Disperse systems
3. Microbial decomposition
4. Over-view, physical stability of novel drug carriers, liposomes, niosomes, nano-particles.

UNIT - III
Identification and quantitative determination of preservatives, Antioxidants, colouring materials, emulsifiers and stabilizers in Pharmaceutical formulation.
Analysis of drugs from biological samples including, selection of biological sample, extraction of drugs by various methods as LLE, SPE and Membrane filtration.Factors affecting extraction of drugs.

UNIT - IV
General method of analysis to determine the quality of raw materials used in cosmetic industry. Indian Standard Specifications (ISI) laid down for sampling and testing of various cosmetics in finished form by the Bureau of Indian Standards.

UNIT - V
Methods of analysis to determine the quality of cosmetics in the finished forms such as Hair care products, Skin care products, Baby care products, Dental products, Personal hygiene products, Colour cosmetics, Ethnic products, Colour makeup preparation, Lipsticks, Hair setting lotions and Eye shadows. Toxicity testing in cosmetics and Safety and Legislation of Cosmetic products.
Stability studies: Concept of stability studies.
a) cGMP& ICH guidelines for Accelerated stability Testing.
b) Interaction of containers & closure Compatibility Testing.

REFERENCE BOOKS:

1. Comprehensive Pharmacy Review 5th Edition by Leon Shargel, Alan H. Mutnick, Paul F. Souney, Larry N. Sawnson – 2004.
2. A. H. Beckett and J. B. Stenlake Practical Pharmaceutical Chemistry, Part I and Part II, 4th Edition. 3. G. H. Jeffery, J. Basset, J. Mendham, R. C. Denny (Rev. by) Vogels Text Book of Quantitative Chemical Analysis, 5th Edition 1989, ELBS.
3. The Controller of Publications; New Delhi, Govt. of India, Indian Pharmacopoeia, Vol. I and Vol. II - 2010.
4. J. B. Wilkinson and R. J. Moore, Herry's Cosmeticology; Longman Scientific and Technical Publishers, Singapore.
5. P.D. Sethi; Quantitative Analysis of Drugs in Pharmaceutical Formulations, 3rd Edition - 1997,
6. Classification of cosmetics raw materials and adjuncts IS 3958 of Indian Standards Institution (BIS).
7. Cosmetic and toilet goods – methods of sampling IS 3958 of Indian Standards Institution (BIS).
8. Methods of sampling and test for various cosmetics as laid down by Bureau of Indian Standards.
9. Drug stability: Principles and practices by Jens T. Carstensen
10. Stability Testing of Drug Products by W. Grimm.
11. Stability of Drugs and Dosage Forms by Yoshioka and Stella.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Regulatory Affairs)

PHARMACEUTICAL FORMULATION TECHNOLOGY (Professional Elective - II)

Course Objective: Students will know the preformulation studies, methodology, different excipients used in solid dosage forms and their evaluation with references to production technologies. The students also know the optimization techniques and their applications in pharmaceutical industries.

Course Outcome: Students shall explain the preformulation parameters, apply ICH guidelines and evaluate drug, drug excipients compatibility. Students also explain about formulation and development, use of excipients in tablets, powders, capsules, micro-encapsules and coating techniques. They also learn and apply the statistical design in different formulations.

UNIT - I
Preformulation: Goals of preformulation, solid state manipulation and characterization. pH dependent solubility of drug, equilibrium solubility, intrinsic dissolution of drug, particle size distribution.
Flow of Powders: Physical properties and importance. Angle of repose, Cars index, compressibility, bulk density, tapped density.

UNIT - II
Excipients used in various dosage forms like tablets, capsules, emulsions, suspensions, semisolids and sterile products. Knowledge of packing materials. Drug- excipient compatibility- Drug stability, factors affecting stability, stabilization methods.

UNIT - III
Tablets: Types of tablets, granulation methods, highlighting operations such as mixing, drying, milling, blending, lubrication and compression.
Tablet coating: Types of coating, steps involved in coating process- pan coating and fluid bed coating and problems associated with coating.
Hard Gelatin Capsules: General principles and steps involved in the production of drug loaded hard gelatin capsules, filling operation, filling of powders, granules and pellets.

UNIT - IV
Dissolution: Principles of dissolution, factors influencing dissolution, official methods and apparatus. Dissolution of immediate release, controlled release and delayed release products.

UNIT - V
Stability testing: Chemical degradation and preventive measures. Various stability testing conditions and use of stabilizers in packing

TEXT BOOKS:
1. Pharmaceutics - The Science of Dosage form design by ME Aulton.
2. Pharmaceutical Dosage forms - Tablets (Vol I, II and III) by Lieberman, Lachman and Schwartz.
3. Pharmaceutical Dosage forms - Capsules (Vol I, II and III) by Avis, Lieberman and Lachman.
4. Pharmaceutical Dosage forms – Disperse systems (Vol I, II and III) by Avis, Lieberman and Lachman.
5. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.

6. Pharmaceutical statistics by Bolton Industrial Pharmacy - Selected Topics, CVS Subramanyam and J Thimmasetty, Vallabha Prakashan Delhi - 2013

REFERENCE BOOKS:

1. The Theory and Practice of industrial Pharmacy by Leon Lachman, Herbert A. Lieberman.
2. Remington's Science and Practice of Pharmacy by A. Gennaro.
3. Ansel's Pharmaceutical Dosage form and Drug delivery system by Loyd V. Allen, Jr. Nicholas
   G. Popovich, Howard C. Ansel.
4. Generic Drug Product Development by Leon Shargel and Isadore Kanfer.
5. Dispensing for Pharmaceutical Students by SJ Carter.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Regulatory Affairs)

DOCUMENTATION AND REGULATORY WRITING (Professional Elective - II)

Course Objective: This course is designed to impart fundamental knowledge on documentation and general principles involved in regulatory writing and submission to agencies.

Course Outcomes: Upon completion of the course the student shall be able to,

- Know the various documents pertaining to drugs in pharmaceutical industry
- Understand the basics of regulatory compilation
- Create and assemble the regulation submission as per the requirements of agencies
- Follow up the submissions and post approval document requirements

UNIT - I

Documentation in pharmaceutical industry: Exploratory Product Development Brief (EPDB) for Drug substance and Drug product, Product Development Plan (PDP), Product Development Report (PDR), Master Formula Record, Batch Manufacturing Record and its calculations, Batch Reconciliation, Batch Packaging Records, Print pack specifications, Distribution records, Certificate of Analysis (CoA), Site Master File and Drug Master Files (DMF).

UNIT - II

Dossier preparation and submission: Introduction and overview of dossiers, contents and organization of dossier, binders and sections, compilation and review of dossier. Paper submissions, overview and modules of CTD, electronic CTD submissions; Electronic submission: Planning electronic submission, requirements for submission, regulatory bindings and requirements, Tool and Technologies, electronic dossier submission process and validating the submission, Electronic Submission Gateway (ESG). None CTD electronic submissions (NeeS), Asian CTD formats (ACTD) submission. Organizing, process and validation of submission. Submission in Sugam system of CDSCO.

UNIT - III

Audits: Introduction, Definition, Summary, Types of audits, GMP compliance audit, Audit policy, Internal and External Audits, Second Party Audits, External third-party audits, Auditing strategies, Preparation and conducting audit, Auditing strategies, audit analysis, audit report, audit follow up. Auditing/inspection of manufacturing facilities by regulatory agencies. Timelines for audits/inspection. GHTF study group 4 guidance document. ISO 13485.

UNIT - IV

Inspections: Pre-approval inspections, Inspection of pharmaceutical manufacturers, Inspection of drug distribution
channels, Quality systems requirements for national good manufacturing practice inspectorates, inspection report, model certificate of good manufacturing practices, Root cause analysis, Corrective and Preventive action (CAPA).

UNIT - V

Product life cycle management: Prior Approval Supplement (PAS), Post Approval Changes [SUPAC], Changes Being Affected in 30 Days (CBE-30), Annual Report, Post marketing Reporting Requirements, Post approval Labeling Changes, Lifecycle Management, FDA Inspection and Enforcement, Establishment Inspection Report (EIR), Warning Letters, Recalls, Seizure and Injunctions. ISO Risk Management Standard

TEXT AND REFERENCE BOOKS:

1. Compliance auditing for Pharmaceutical Manufacturers. Karen Ginsbury and Gil Bismuth, Interpharm/CRC, Boca Raton, London New York, Washington D.C.
2. Pharmaceutical Manufacturing Handbook, Regulations and Quality by Shayne Cox Gad. Wiley- Interscience, A John Wiley and sons, Inc., Publications.
3. Handbook of microbiological Quality control. Rosamund M. Baird, Norman A. Hodges, Stephen
4. P. Denyar. CRC Press. 2000.
5. Laboratory auditing for quality and regulatory compliance. Donald C. Singer, Raluca-Ioana Stefan, Jacobus F. Van Staden. Taylor and Francis (2005).
6. Implementing Juran's Road Map for Quality Leadership: Benchmarks and Results, By Al Endres, Wiley, 2000
7. Understanding, Managing and Implementing Quality: Frameworks, Techniques and Cases, By Jiju Antony; David Preece, Routledge, 2002
8. Organizing for High Performance: Employee Involvement, TQM, Reengineering, and Knowledge Management in the Fortune 1000: The CEO Report By Edward E. Lawler; Susan Albers Mohrman; George Benson, Jossey-Bass, 2001
9. Corporate Culture and the Quality Organization By James W. Fairfield- Sonn, Quorum Books, 2001
10. The Quality Management Sourcebook: An International Guide toMaterials and Resources By Christine Avery; Diane Zabel, Routledge, 1997
11. The Quality Toolbox, Second Edition, Nancy R. Tague, ASQ Publications
12. Juran's Quality Handbook, Sixth Edition, Joseph M. Juran and Joseph A. De Feo, ASQ Publications
13. Root Cause Analysis, The Core of Problem Solving and Corrective Action, Duke Okes, 2009, ASQ Publications
14. International Medical Device Regulators Forum (IMDRF) Medical Device Single Audit Program (MDSAP)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Regulatory Affairs)

RESEARCH METHODOLOGY AND IPR

Course Objectives:

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

Course Outcomes: At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT - I:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT - II:

Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT - III:

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT - IV:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-V:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

REFERENCES:

1. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
2. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
3. Mayall, “Industrial Design”, McGraw Hill, 1992.
4. Niebel, “Product Design”, McGraw Hill, 1974.
5. Asimov, “Introduction to Design”, Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”, 2016.
7. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

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Kommula Vill, Vijayapuri Colony,
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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Regulatory Affairs)

REGULATORY PRACTICE AND DOCUMENTATION LAB (Laboratory - I)

List of Experiments:

1. Case studies (4 Nos.) of each of Good Pharmaceutical Practices.
2. Documentation for in process and finished products Quality control tests for Solid, liquid, Semisolid and Sterile preparations.
3. Preparation of SOPs, Analytical reports (Stability and validation)
4. Protocol preparation for documentation of various types of records (BMR, MFR, DR) Labeling comparison between brand & generics.
5. Preparation of regulatory dossier as per Indian CTD format and submission in SUGAM
6. Case studies on response with scientific rationale to USFDA Warning Letter
7. Preparation of submission checklist of IMPD for EU submission.
8. Comparison study of marketing authorization procedures in EU.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (Pharmaceutical Regulatory Affairs)

DRUG REGULATION AND REGISTRATION LAB (Laboratory - II)

List of Experiments:

1. Case studies on Change Management/ Change control. Deviations and Corrective & Preventive Actions (CAPA)
2. Import of drugs for research and developmental activities
3. GMP Audit Requirements as per CDSCO
4. Preparation of checklist for registration of IND as per ICH CTD format.
5. Preparation of checklist for registration of NDA as per ICH CTD format.
6. Preparation of checklist for registration of ANDA as per ICH CTD format.
7. Comparative study of DMF system in US, EU and Japan
8. Preparation of regulatory submission using eCTD software
9. Documentation of raw materials analysis as per official monographs
10. Preparation of audit checklist for various agencies
11. Preparation of submission to FDA using eCTD software
12. Preparation of submission to EMA using eCTD software
13. Preparation of submission to MHRA using eCTD software

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Regulatory Affairs)

REGULATORY ASPECTS OF MEDICAL DEVICES (Professional Core - III)

Course Objective: This course is designed to impart the fundamental knowledge on the medical devices and in vitro diagnostics, basis of classification and product life cycle of medical devices, regulatory requirements for approval of medical devices in regulated countries like US, EU and Asian countries along with WHO regulations. It prepares the students to learn in detail on the harmonization initiatives, quality and ethical considerations, regulatory and documentation requirements for marketing medical devices and IVDs in regulated countries.

Course Outcome: Upon completion of the course, the student shall be able to know;

- Basics of medical devices and IVDs, process of development, ethical and quality considerations.
- Harmonization initiatives for approval and marketing of medical devices and IVDs.
- Regulatory approval process for medical devices and IVDs in India, US, Canada, EU, Japan and ASEAN.
- Clinical evaluation and investigation of medical devices and IVDs.

UNIT - I

Medical Devices: Introduction, Definition, Risk based classification and Essential Principles of Medical Devices and IVDs. Differentiating medical devices IVDs and Combination Products from that of pharmaceuticals, History of Medical Device Regulation, Product Lifecycle of Medical Devices and Classification of Medical Devices.

IMDRF/GHTF: Introduction, Organizational Structure, Purpose and Functions, Regulatory Guidelines, Working Groups, Summary Technical Document (STED), Global Medical Device Nomenclature (GMDN).

UNIT - II

Ethics: Clinical Investigation of Medical Devices, Clinical Investigation Plan for Medical Devices, Good Clinical Practice for Clinical Investigation of medical devices (ISO 14155:2011) Quality: Quality System Regulations of Medical Devices: ISO 13485, Quality Risk Management of Medical Devices: ISO 14971, Validation and Verification of Medical device, Adverse Event Reporting of Medical device

UNIT - III

USA: Introduction, Classification, Regulatory approval process for Medical Devices (510k) Premarket Notification, Pre-Market Approval (PMA), Investigational Device Exemption (IDE) and In vitro Diagnostics, Quality System Requirements 21 CFR Part 820, Labeling requirements 21 CFR Part 801, Post marketing surveillance of MD and Unique Device Identification (UDI). Basics of In vitro diagnostics, classification and approval process.

UNIT - IV

European Union: Introduction, Classification, Regulatory approval process for Medical Devices (Medical Device Directive, Active Implantable Medical Device Directive) and In vitro Diagnostics (In Vitro Diagnostics Directive), CE certification process. Basics of In vitro diagnostics, classification and approval process.

UNIT - V

ASEAN, China & Japan: Medical Devices and IVDs, Regulatory registration procedures, Quality System requirements and clinical evaluation and investigation. IMDRF study groups and guidance documents.

REFERENCE BOOKS:

1. FDA regulatory affairs: a guide for prescription drugs, medical devices, and biologics by Douglas J. Pisano, David Mantus.
2. Medical Device Development: A Regulatory Overview by Jonathan S. Kahan
3. Medical Product Regulatory Affairs: Pharmaceuticals, Diagnostics, Medical Devices by John J. Tobin and Gary Walsh
4. Compliance Handbook for Pharmaceuticals, Medical Devices and Biologics by Carmen Medina
5. Country Specific Guidelines from official websites.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Regulatory Affairs)

REGULATORY ASPECTS OF HERBALS AND BIOLOGICALS (Professional Core - IV)

Course Objective: This course is designed to impart fundamental knowledge on Regulatory Requirements, Licensing and Registration, Regulation on Labelling of Biologics in India, USA and Europe It prepares the students to learn in detail on Regulatory Requirements for biologics, Vaccines and Blood Products

Course Outcome: **Upon the completion of the course the student shall be able to :**

- Know the regulatory Requirements for Biologics and Vaccines
- Understand the regulation for newly developed biologics and biosimilars
- Know the pre-clinical and clinical development considerations of biologics
- Understand the Regulatory Requirements of Blood and/or Its Components Including Blood Products and label requirements

UNIT - I

India: Introduction, Applicable Regulations and Guidelines, Principles for Development of Similar Biologics, Data Requirements for Preclinical Studies, Data Requirements for Clinical Trial Application, Data Requirements for Market Authorization Application, Post-Market Data for Similar Biologics, Pharmacovigilance. GMP and GDP.

UNIT - II

USA: Introduction to Biologics; biologics, biological and biosimilars, different biological products, difference between generic drug and biosimilars, laws, regulations and guidance on biologics/ biosimilars, development and approval of biologics and biosimilars (IND, PMA, BLA, NDA, 510(k), pre-clinical and clinical development considerations, advertising, labelling and packing of biologics.

UNIT - III

European Union: Introduction to Biologics; directives, scientific guidelines and guidance related to biologics in EU, comparability/ bio similarity assessment, Plasma master file, TSE/ BSE evaluation, development and regulatory approval of biologics (Investigational medicinal products and biosimilars), pre-clinical and clinical development considerations; stability, safety, advertising, labelling and packing of biologics in EU.

UNIT - IV

Vaccine regulations in India, US and European Union: Clinical evaluation, Marketing authorization, Registration or licensing, Quality assessment, Pharmacovigilance, Additional requirements Blood and Blood Products Regulations in India, US and European Union: Regulatory Requirements of Blood and/or Its Components Including Blood Products, Label Requirements, ISBT (International Society of Blood Transfusion) and IHN (International Haemovigilence Network)

UNIT - V

Herbal Products: Quality, safety and legislation for herbal products in India, USA and European Union.

TEXT AND REFERENCE BOOKS:

1. FDA Regulatory Affairs: A Guide for Prescription Drugs, Medical Devices, and Biologics, Douglas J. Pisano, David S. Mantus ; Informa ,2008
2. Biological Drug Products: Development and Strategies; Wei Wang, Manmohan Singh; wiley,2013

3. Development of Vaccines: From Discovery to Clinical Testing; Manmohan Singh, Indresh K. Srivastava; Wiley, 2011
4. www.who.int/biologicals/en
5. www.fda.gov/BiologicsBloodVaccines/GuidanceComplianceRegulatoryInformation/
6. www.ihn-org.com
7. www.isbtweb.org
8. Guidelines on Similar Biologics: Regulatory Requirements for Marketing Authorization in India
9. www.cdsco.nic.in
10. www.ema.europa.eu › scientific guidelines › Biologicals
11. www.fda.gov/biologicsbloodVaccines/GuidanceCompliance Regulatory Information (Biologics)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Regulatory Affairs)
REGULATORY ASPECTS OF FOOD AND NUTRACEUTICALS (Professional Elective - III)

Course Objective: This course is designed to impart the fundamental knowledge on Regulatory Requirements, Registration and Labeling Regulations of Nutraceuticals in India, USA and Europe. It prepares the students to learn in detail on Regulatory Aspects for nutraceuticals and food supplements.

Course Outcome: Upon completion of the course, the student shall be able to

a. Know the regulatory Requirements for nutraceuticals
b. Understand the regulation for registration and labeling of nutraceuticals and food supplements in India, USA and Europe.

UNIT - I

Nutraceuticals: Introduction, History of Food and Nutraceutical Regulations, Meaning of Nutraceuticals, Dietary Supplements, Functional Foods, Medical Foods, Scope and Opportunities in Nutraceutical Market.

UNIT - II

Global Aspects: WHO guidelines on nutrition. NSF International: Its Role in the Dietary Supplements and Nutraceuticals Industries, NSF Certification, NSF Standards for Food And Dietary Supplements. Good Manufacturing Practices for Nutraceuticals.

UNIT - III

India: Food Safety and Standards Act, Food Safety and Standards Authority of India: Organization and Functions, Regulations for import, manufacture and sale of nutraceutical products in India, Recommended Dietary Allowances (RDA) in India.

UNIT - IV

USA: US FDA Food Safety Modernization Act, Dietary Supplement Health and Education Act. U.S. regulations for manufacture and sale of nutraceuticals and dietary supplements, Labelling Requirements and Label Claims for Dietary Supplements, Recommended Dietary Allowances (RDA) in the U.S

UNIT - V

European Union: European Food Safety Authority (EFSA): Organization and Functions. EU Directives and regulations for manufacture and sale of nutraceuticals and dietary supplements. Nutrition labelling. European Regulation on Novel Foods and Novel Food Ingredients. Recommended Dietary Allowances (RDA) in Europe.

TEXT AND REFERENCE BOOKS:

1. Regulation of Functional Foods and Nutraceuticals: A Global Perspective by Clare M. Hasler (Wiley Online Library)
2. Nutraceutical and Functional Food Regulations in the United States and Around the World by Debasis Bagchi (Academic Press, Elsevier)
3. http://www.who.int/publications/guidelines/nutrition/en/
4. http://www.europarl.europa.eu/RegData/etudes/STUD/2015/536324/IPOL_STU(2015)536324_EN.pdf
5. Handbook of Nutraceuticals by Yashwant Pathak (CRC Press)
6. Food Regulation: Law, Science, Policy and Practice by Neal D. Fortin (Wiley)
7. Country Specific Guidelines from official websites.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Regulatory Affairs)

BIOSTATISTICS AND RESEARCH METHODOLOGY (Professional Elective - III)

Course Objective: The student shall know the introduction, scope of biostatistics and Research work, calculation and present of the data. It also informs the students, how the present research work writing and correlating.

Course Outcome: The student will be known the Biostatistics arrangement, presentation, and formation of tables and charts. They also know the correlation and regression & application of different methods, analysis of data and also learn how to write dissertation, thesis and Research paper.

UNIT - I
Introduction and scope of biostatistics: Use of statistics in Pharmacy. Population and Sample collection. Stages of research, types of data and methods of data collections. Data arrangement and presentation, formation of table and charts.

UNIT - II
Measures of central tendency: computation of means, median and mode from grouped and ungrouped data.
Measure of dispersion: computation of variance, standard deviation, standard error and their coefficients.

UNIT - III
Measures of Correlation and Regression: Experimental designing, planning of an experiment, replication, and randomization. Probit analysis.
Probability rules: Binomial, Poison and Normal distribution.
Hypothesis testing: Student't' test, Chi square test, Analysis of Variance (ANOVA): 1-way, 2-way, 3-ways

UNIT - IV
Developing a research question, Resources for research question, Literature Review: Traditional Qualitative Review, Meta-Analysis—A Quantitative Review Preparation of Research Proposal
Variables—Definition of Variable, Types of variables (Dependent and Independent variables, Confounded variables), Measurement of variables, Types of measurement scales and their comparison. Reliability and Validity of Measurements.

UNIT - V
The research report paper writing/ thesis writing Different parts of the research paper

1. Title-Title of project with authors' name
2. Abstract – Statement of the problem, Background list in brief and purpose and scope
3. Key words
4. Methodology- subject, apparatus, instrumentation and procedure
5. Results – tables, graphs figure and statistical presentation
6. Discussion support or non-support of hypothesis, practical and theoretical implications
7. Conclusion
8. Acknowledgements
9. References
10. Errata
11. Importance of Spell check for entire projects
12. Uses of footnotes

TEXT BOOKS:

1. Deepak Chawla Neena Sondhi, Research Methodology Concepts and Cases, Vikas books publishers
2. Donald H. McBurney -Theresa L. White "Research Methods" (Cengage learning India Pvt. Ltd)

REFERENCE BOOKS:

1. Remington's Pharmaceutical Sciences
2. Theory & Practice of Industrial Pharmacy by Lachman
3. Statistics for business and economics 3rd edition by Vikas books publications
4. Biostatistics & Computer applications by GN Rao and NK Tiwari
5. Sokal, R.R. and Rohlf, F.J. 1987. An Introduction to Biostatistics. W.H. Freeman and Company.
6. Bailey, N.T.J. 1981. Statistical Methods in Biology. English University Press.
7. Mitchell, K. and Glover, T. 2001. Introduction to Biostatistics. McGraw Hill, Publishing Co.
8. Biostatistics and Computer Applications by G.N. Rao and N.K. Tiwari
9. Fundamentals of Biostatistics by Khan and Khanum
10. Research Methodology by R K Khanna bis and Suvasis Saha
11. Research methods and Quantity methods by G. N. Rao
12. A practical approach to PG dissertation.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Regulatory Affairs)

NANO BASED DRUG DELIVERY SYSTEMS (Professional Elective – III)

Course Objective - To develop expertise regarding suitability and evaluation of nanomaterials, able to apply the properties to the fabrication of nanopharmaceutical, evaluate the intensity of dosage forms and availability for targeting and controlled delivery.

Course Outcomes – The students should be able to select the right kind of materials, able to develop nano formulations with appropriate technologies, evaluate the product related test and for identified diseases

UNIT - I – Introduction to Nanotechnology

a. Definition of nanotechnology
b. History of nanotechnology
c. Unique properties and classification of nanomaterials
d. Role of size and size distribution of nanoparticles properties.
e. Marketed formulations based on nanotechnology and science behind them

UNIT - II – Synthesis of Nanomaterials

Physical, chemical and biological Methods
Methods for synthesis of

- Gold nanoparticles
- Magnetic nanoparticles
- Polymeric nanoparticles
- Self – assembly structures such as liposomes, Niosomes, transferasomes, micelles, aquasomes and nanoemulsions

UNIT - III - Biomedical applications of Nanotechnology

a. Nanotechnology products used for in vitro diagnostics
b. Improvements to medical or molecular imaging using nanotechnology
c. Targeted nanomaterials for diagnostic and therapeutic purpose

UNIT - IV

Design of nanomaterials for drug delivery, pulmonary and nasal drug delivery, nanomaterials for cancer therapy and cardiovascular diseases. Localized drug delivery systems.

UNIT - V

Characterization including the principles, size reduction, analysis of nanoparticles, size, PDI, size separation, stability, methods of analysis regarding integrity and release of drugs

RECOMMENDED BOOKS:

1. Nanomedicine and Nanoproducts: Applications, Disposition and Toxicology in the Human body, Eiki Igarashi, CRC press. 2015
2. Nanotechnology and Drug Delivery Volume one and two: Nanoplatforms in Drug Delivery, Jose L. Arias, CRC press
3. Nano: The Essentials: Understanding Nanoscience and Nanotechnology, T. Pradeep, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008.
4. Nanocrystals: Synthesis, Properties and Applications, C. N. R. Rao, P. J. Thomas and G.U. Kulkarni, Springer (2007)

5. Nanostructures and Nanomaterials: Synthesis, Properties and Application, Guozhong Gao, Imperial College Press (2004)
6. Nano chemistry: A Classical Approach to Nanomaterials – Royal Society for Chemistry, Cambridge, UK (2005)
7. Nanocomposite science and technology, pulickel M. Ajayan, Linda S. Schadler, paul V. Braun, Wiley - VCH Verlag, Weiheim (2003)
8. Nanoscale materials in chemistry, Edited by Kenneth J. Klabunde, John Wiley & Sons,2009
9. Nanoparticles as Drug carriers, Vladimir P Torchiling, Imperial College Press, USA, 2006
10. Introduction to Nano Science and Technologies, Ankaneyulu Yerramilli, BS Publications. 2016
11. Nanoparticles as Drug carriers, Vladimir P Torchiling, Imperial College Press, USA, 2006

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Regulatory Affairs)

CLINICAL RESEARCH AND PHARMACOVIGILANCE (Professional Elective - IV)

Course Objectives: This subject will provide a value addition and current requirement for the students in clinical research and pharmacovigilance. It will teach the students on conceptualizing, designing, conducting, managing and reporting of clinical trials. This subject also focuses on global scenario of pharmacovigilance in different methods that can be used to generate safety data. It will teach the students in developing drug safety data in pre-clinical, clinical phases of drug development and post market surveillance.

Course Outcomes: Upon completion of the course, the student shall be able to;

- explain the regulatory requirements for conducting clinical trial
- Demonstrate the types of clinical trial designs
- Explain the responsibilities of key players involved in clinical trials
- Execute safety monitoring, reporting and close-out activities
- Explain the principles of Pharmacovigilance
- Detect new adverse drug reactions and their assessment
- Perform the adverse drug reaction reporting systems and communication in pharmacovigilance

UNIT - I
Regulatory Perspectives of Clinical Trials:
Origin and Principles of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines Ethical Committee: Institutional Review Board, Ethical Guidelines for Biomedical Research and Human Participant-Schedule Y, ICMR, Informed Consent Process: Structure and content of an Informed Consent Process Ethical principles governing informed consent process

UNIT - II
Clinical Trials: Types and Design:
Experimental Study- RCT and Non RCT, Observation Study: Cohort, Case Control, Cross sectional Clinical Trial Study Team Roles and responsibilities of Clinical Trial Personnel: Investigator, Study Coordinator, Sponsor, Contract Research Organization and its management.

UNIT - III
Clinical Trial Documentation:
Guidelines to the preparation of documents, Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study Report Clinical Trial Monitoring-Safety Monitoring in CT Adverse Drug Reactions: Definition and types. Detection and reporting methods. Severity and seriousness assessment. predictability and preventability assessment. Management of adverse drug reactions; Terminologies of ADR.

UNIT - IV
Basic aspects, terminologies and establishment of pharmacovigilance:
History and progress of pharmacovigilance, Significance of safety monitoring, Pharmacovigilance in India and international aspects, WHO international drug monitoring Program, WHO and Regulatory terminologies of ADR, evaluation of medication safety, establishing pharmacovigilance centres in Hospitals, Industry and National Programs related to pharmacovigilance. Roles and responsibilities in Pharmacovigilance.

UNIT - V

Methods, ADR reporting and tools used in pharmacovigilance:

International classification of diseases, International Nonproprietary names for drugs, Passive and Active surveillance, Comparative observational studies, Targeted clinical investigations and Vaccine safety surveillance. Spontaneous reporting system and Reporting to regulatory authorities, Guidelines for ADRs reporting. Argus, Aris G Pharmacovigilance, VigiFlow, Statistical methods for evaluating medication safety
data.

REFERENCES:

1. Central Drugs Standard Control Organization- Good Clinical Practices, Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
2. International Conference on Harmonization of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonized Tripartite Guideline. Guideline for Good Clinical Practice. E6; May 1996.230
3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
5. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
6. Handbook of clinical Research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone.
7. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
8. Textbook of Pharmacovigilance: Concept and Practice. G.P. Mohanta and P. K. Manna. 2016, Pharma Med Press.
9. A textbook of Clinical Pharmacy Practice: Essential Concepts and Skills. Second Edition, 2012, University Press

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Regulatory Affairs)

NUTRACEUTICALS (Professional Elective - IV)

Course Objectives: The students will expose to characteristic features of various phytochemicals as nutraceuticals in various diseased conditions and also know the role of antioxidant in free radical induced disease conditions and will expose to various food laws and regulations.

Course Outcomes: Helps the student to understand the importance of Nutraceuticals in various common problems with the concept of free radicals

UNIT - I

a. Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer etc.

b. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods:

Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds

UNIT - II

Phytochemicals as nutraceuticals: Occurrence and characteristic features (chemical nature medicinal benefits) of following

a) Carotenoids- α and β-Carotene, Lycopene, Xanthophylls, lutein
b) Sulfides: Diallylsulfides, Allyltrisulfide.
c) Polyphenolics: Reservetrol
d) Flavonoids- Rutin , Naringin, Quercitin, Anthocyanidins, catechins, Flavones
e) Prebiotates / Probiotics.: Fructo oligosaccharides, Lactobacillum
f) Phytoestrogens: Isoflavones, daidzein, Geebustin, lignans
g) Tocopherols

UNIT - III

a. Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids.

b. Measurement of free radicals: Lipid peroxidation products, lipid hydroperoxide, malondialdehyde.

UNIT - IV

a. Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals involvement in other disorders. Free radicals theory of ageing.

b. Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E, α-Lipoic acid, melatonin

Synthetic antioxidants: Butylatedhydroxy Toluene, Butylatedhydroxy Anisole.

UNIT - V

Food Laws and Regulations; FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods.

Regulations and Claims – Current Products: Label Claims, Nutrient Content Claims, Health Claims, Dietary Supplements Claims

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Princeton College of Pharmacy,
Kommula Vill, Vijayapuri Colony,
Ghatkesar Mdl.Medchal Dist .Telangana.

REFERENCES:

1. Dietetics by Sri Lakshmi
2. Role of dietary fibres and nutraceuticals in preventing diseases by K. T. Agusti and P. Faizal: BS Publication.
3. Advanced Nutritional Therapies by Cooper. K.A., (1996).
4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).
5. Prescription for Nutritional Healing by James F.Balch and Phyllis A. Balch 2nd Edn., Avery Publishing Group, NY (1997).
6. G. Gibson and C. Williams Editors *2000 Functional foods* Woodhead Publ. Co. London.
7. Goldberg, I. *Functional Foods*. 1994. Chapman and Hall, New York.
8. Labuza, T.P. 2000 Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in *Essentials of Functional Foods* M. K. Sachmidl and T.P. Labuza eds. Aspen Press.
9. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition)
10. Shils, ME, Olson, JA, Shike, M. 1994 *Modern Nutrition in Health and Disease*. Eighth edition. Lea and Febiger

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Regulatory Affairs)

ADVANCED DRUG DELIVERY SYSTEMS (Professional Elective - IV)

Course Objectives: The students shall apply the pharmacokinetic and pharmacodynamic principles in the design of CDDS. They also apply the design, evaluation and applications related to oral, parenteral, transdermal, implants, bio adhesives and targeted drug delivery systems.

Course Outcomes: Students will select the drugs for CDDS design of the formulation fabrication of systems of above drug delivery systems with relevant applications.

UNIT - I
Fundamentals of controlled drug delivery systems, pharmacokinetic and pharmacodynamic basis of controlled drug delivery. Design, fabrication, evaluation and applications of the following controlled releasing systems
a. Controlled release oral drug delivery systems
b. Parenteral controlled release drug delivery systems

UNIT - II
Design, fabrication, evaluation and applications of the following
a. Implantable Therapeutic systems
b. Transdermal delivery systems
c. Ocular and Intrauterine delivery systems
d. Vaccine delivery: Delivery systems used to promote uptake, absorption enhancers, oral immunization, controlled release microparticles form vaccine development

UNIT - III
Biochemical and molecular biology approaches to controlled drug delivery of
a. Bioadhesive drug delivery systems
b. Nasal drug delivery systems
c. Drug delivery to Colon

UNIT - IV
Biochemical and molecular biology approaches to control drug delivery of
a. Liposomes
b. Niosomes
c. Microspheres
d. Nanoparticles
e. Resealed erythrocytes

UNIT - V
Drug targeting to particular organs
a. Delivery to lungs
b. Delivery to the brain and problems involved
c. Drug targeting in neoplasams

TEXT BOOKS:
1. Novel Drug Delivery System by Yie W. Chien.
2. Controlled Drug Delivery by Joseph R. Robinson and Vincent H. L. Lee.
3. Controlled and Novel Drug Delivery Systems by N. K. Jain.
4. Targeted and Controlled Drug Delivery (Novel carrier systems) by S. P. Vyas and Khar.

5. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.
6. Advances in Drug Delivery, Vol 1, 2, 3 by Y. Madhusudan Rao, A.V. Jithan
7. Oral Drug Delivery Technology, 2nd ed, by Aukunuru Jithan

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Regulatory Affairs)

REGULATORY ASPECTS OF HERBALS AND BIOLOGICAL LAB (Laboratory - III)

List of Experiments:

1. Preparation of Biologics License Applications (BLA)
2. Preparation of documents required for Vaccine Product Approval
3. Comparison of clinical trial application requirements of US, EU and India of Biologics
4. Preparation of Checklist for Registration of Blood and Blood Products
5. Registration requirement comparison study in 5 emerging markets (WHO) and preparing check list for market authorization
6. Registration requirement comparison study in emerging markets (BRICS) and preparing check list for market authorization
7. Registration requirement comparison study in emerging markets (China and South Korea) and preparing check list for market authorization
8. Registration requirement comparison study in emerging markets (ASEAN) and preparing check list for market authorization
9. Registration requirement comparison study in emerging markets (GCC) and preparing check list for market authorization
10. Preparation of document required for the approval of herbal products of diverse dosage forms(3products) as per regulations requirements

Practical work shall be carried out based on the theory syllabus.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (Pharmaceutical Regulatory Affairs)

REGULATORY ASPECTS OF MEDICINAL DEVICES LAB (Laboratory - IV)

List of Experiments:

1. Checklists for 510k and PMA for US market
2. Checklist for CE marking for various classes of devices for EU
3. STED Application for Class III Devices
4. Audit Checklist for Medical Device Facility
5. Clinical Investigation Plan for Medical Devices
6. Preparation and submission of medical devices for approval (3 products)
7. GMP of manufacturing of medical devices of diverse nature (3 products)
8. preparation and submission of nutraceuticals devices for approval (3 products)

Practical work shall be carried out based on the theory syllabus

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm II Year I Sem (Pharmaceutical Regulatory Affairs)

ANALYTICAL METHOD VALIDATION (Professional Elective - V)

Course Objectives: This topic will impart knowledge about analytical validation within pharmaceutical environment, its design and execution. this also gives about validation parameters and few instrumental validation.

Course Outcomes: Upon completion of this subject the student will know about importance of validation, its parameter along with ICH limits and validations of analytical instruments

UNIT – I

Analytical Validation within the Pharmaceutical Environment

Regulatory Requirements, Integrated and Continuous Validation, General Planning and Design of Validation Studies, Evaluation and Acceptance Criteria, Statistical Tests.

UNIT - II

Performance Parameters, Calculations and Tests

a) **Precision:** Precision Levels, Acceptable Ranges for Precisions, Sources to Obtain and Supplement Precisions, Specificity
b) **Specificity:** Demonstration of Specificity by Accuracy, Chromatographic Resolution, Peak Purity (Co-elution)
c) **Accuracy:** Drug Substance, Drug Product, Impurities/Degradants and Water, Cleaning Validation Methods, Acceptance Criteria

UNIT - III

d) **Linearity:** Unweighted Linear Regression, Weighted Linear Regression, Non-linear and Other Regression Techniques
e) **Detection and Quantitation Limit:** Analytical Detector Responses, Requirements for DL/QL in Pharmaceutical Impurity Determination, Approaches Based on the Blank, Determination of DL/QL from Linearity, Precision-based Approaches, Comparison of the Various Approaches
f) **Robustness:** Terminology and Definitions, Fundamentals of Robustness Testing, Examples of Computer-assisted Robustness Studies

UNIT - IV

Qualification of Analytical Equipment

Introduction, Terminology, An Overview of the Equipment Qualification Process, Documentation of the EQ Process, Phases of Equipment Qualification, Design Qualification (DQ), Installation Qualification (IQ), Operational Qualification (OQ), Performance Qualification (PQ)

UNIT - V

Acceptance Criteria and Analytical Variability

Introduction, Analytical Variability, Uncertainty of the Uncertainty, Estimating the Analytical Uncertainty, Acceptance Criteria, Assay of Drug Substances, Assay of Active Ingredients in Drug Products, Dissolution Testing, Stability Testing

REFERENCES

1. Method validation in Pharmaceutical Analysis by J. Emer and J.H. McB. Miller. WILEY publications

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm II Year I Sem (Pharmaceutical Regulatory Affairs)

PHARMACEUTICAL INDUSTRY MANAGEMENT (Professional Elective - V)

Course Objective: This particular study of the course aimed at achieving, enabling the student effectively manage a given organization in planning, hiring, personnel, selection training and other infrastructures maintenance apart from design, lay-out and handling of the equipment.

Course Outcome: This subject aims at validation of different process, equipment methods and effective management of waste materials.

UNIT - I

Human Resource management: Human resource planning, job analysis and design, recruitment, Personnel selection, orientation and placement, training and development, supervision, performance appraisal key result area and key performance area remuneration and salaries, Compensation and incentives, industrial relations, motivation.

UNIT - II

Entrepreneurship and Project Management - Quality Assurance Management:

Total quality management, Organization and personnel, responsibilities, training, hygiene Premises: Location, design, layout, construction, maintenance, and sanitations, environmental control, sterile areas, control contamination, Equipments procedure and documentation for selection, purchase, speciation, installation and maintenance, clean in place, sterilization in place.

UNIT - III

Production management:

Production organization, objectives and policies of good manufacturing practices, layout of buildings, services, equipments and their maintenance, materials management, handling and transportation, inventory management and control, production planning and control, selection of vendors, purchase cycle, sales forecasting, budget and cost control.

UNIT - IV

Process validation: General Principles of Validation, Regulatory basis, validation of pharmaceutical equipment and processes, validation of analytical methods.

UNIT - V

Industrial Hazards and Pollution Management:

Chemical hazards, gas hazards, fire and explosion hazards, safety management. Water pollution, water Pollution abatement and effluent treatment, Air Pollution, air Pollution Control Devices. Solid waste, Solid Waste Management, Noise Pollution, Noise Abatement, Effluent Analysis and Treatment-Methods, Effluent Treatment in Formulation Plants, Effluent Treatment in Synthetic Drugs Industry, Effluent Treatment in Fermentation Industry, Introduction of Echo Pharmacovigilance.

REFERENCES:

1. Unit operations of Chemical Engineering by Warren L. McCabe, Julian C. Smith, Peter Harriott.
2. The Theory and Practice of industrial Pharmacy by Leon Lachman, Herbert A. Lieberman.
3. Pharmaceutical Process validation by Robert A. Nash, Alfred H. Wachter.
4. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.
5. Pharmaceutical production management, C.V.S. Subrahmanyam, Vallabh Prakash.

TEXT BOOKS

1. Remington's Science and Practice of Pharmacy by A. Gennaro.
2. Bentley's Text book of Pharmaceutics by EA Rawlins.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm II Year I Sem (Pharmaceutical Regulatory Affairs)

PHARMACEUTICAL PRODUCTION TECHNOLOGY (Professional Elective - V)

Course Objective: The students shall know about the pilot plant scale up techniques for manufacturing of tablets capsules, suspensions, emulsions and semisolids. The students also know about the filling of capsules, compression machines, sterilizers for formulation of parenterals and also know about the propellants, DPI, MDI and their quality control. The students also know about the cosmetics and neutraceuticals.

Course Outcomes: Students will know about the scale up and pilot plant techniques used for all pharmaceutical dosage forms like tablets, capsules, parenterals, aerosols, cosmetics and nutraceuticals.

UNIT - I

Pilot plant scale-up techniques used in pharmaceutical manufacturing

a. **Pilot plant:** Technology transfer from R&D to pilot plant to pilot scale considerations of steps involved with manufacture, layout design, facility, equipment selection of tablets, capsules, suspensions, emulsions & semisolids.
b. **Scale up:** Importance, Scale up process-size reduction, mixing, blending, granulation, compression, coating involved in tablets, capsules & liquid-liquid mixing.

UNIT - II

Formulation development of parenteral dosage forms: Advances in materials and production techniques, filling machines, sterilizers, product layout.

UNIT - III

Pharmaceutical Aerosols: Advances in propellants, metered dose inhaler designs, dry powder inhalers, selection of containers and formulation aspects in aerosols formulation, manufacture and quality control.

UNIT - IV

a. Cosmetics: Formulation approaches, preparation & method of manufacturing labeling& Q.C. of anti ageing products, sun screen lotion and fairness creams.
b. Nutraceuticals:
1. Introduction, source, manufacture and analysis of glucosamine and cartinine.
2. Monographs: General and specific properties of glucosamine & cartinine.
3. A brief overview of role of nutraceuticals in cancer prevention & cardio vascular disorders.

UNIT - V

Aseptic processing operation

a. Introduction, contamination control, microbial environmental monitoring, microbiological testing of water, microbiological air testing, characterization of aseptic process, media and incubation condition, theoretical evaluation of aseptic operations.
b. Air handling systems: Study of AHUs, humidity & temperature control.

TEXT BOOKS:

1. Pharmaceutics - The Science of Dosage form design by ME Aulton.
2. The Theory and Practice of industrial Pharmacy by Leon Lachman, Herbert A. Lieberman.
3. Remington's Science and Practice of Pharmacy by A. Gennaro.

4. Ansel's Pharmaceutical Dosage form and Drug delivery system by Loyd V. Allen, Jr. Nicholas G. Popovich, Howard C. Ansel.
5. Pharmaceutical Dosage forms - Parenterals (Vol I, II and III) by Avis, Lieberman and Lachman.
6. Scale up techniques – Pharmaceutical process by Michael Levin, Marcel Dekker

REFERENCE BOOKS:

1. Bentley`s Text Book of Pharmaceutics by EA Rawlins.
2. Generic Drug Product Development by Leon Shargel.
3. Dispensing for Pharmaceutical Students by SJ Carter.
4. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.
5. Nutraceuticals, 2nd edition by Brian lock wood

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Regulatory Affairs)

ENGLISH FOR RESEARCH PAPER WRITING (Audit Course - I & II)

Prerequisite: None

Course objectives: Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

UNIT-I:
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-II:
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-III:
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV:
key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT-V:
skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

TEXT BOOKS/ REFERENCES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Regulatory Affairs)

DISASTER MANAGEMENT (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches,
- planning and programming in different countries, particularly their home country or the countries they work in

UNIT-I:
Introduction:
Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.
Disaster Prone Areas in India:
Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-II:
Repercussions of Disasters and Hazards:
Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III:
Disaster Preparedness and Management:
Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-IV:
Risk Assessment Disaster Risk:
Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT-V:
Disaster Mitigation:
Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

TEXT BOOKS/ REFERENCES:

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “’New Royal book Company.
2. Sahni, Pardeep Et. Al. (Eds.),” Disaster Mitigation Experiences and Reflections”, Prentice Hall of India, New Delhi.
3. Goel S. L., Disaster Administration and Management Text and Case Studies”, Deep &Deep Publication Pvt. Ltd., New Delhi.

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M.Pharm (Pharmaceutical Regulatory Affairs)

SANSKRIT FOR TECHNICAL KNOWLEDGE (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Course Outcomes: Students will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

UNIT-I:
Alphabets in Sanskrit,

UNIT-II:
Past/Present/Future Tense, Simple Sentences

UNIT-III:
Order, Introduction of roots,

UNIT-IV:
Technical information about Sanskrit Literature

UNIT-V:
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TEXT BOOKS/ REFERENCES:

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Regulatory Affairs)

VALUE EDUCATION (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

Course outcomes: Students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality

UNIT-I:
Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

UNIT-II:
Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

UNIT-III:
Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

UNIT-IV:
Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT-V:
Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation, Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

TEXT BOOKS/ REFERENCES:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Regulatory Affairs)

CONSTITUTION OF INDIA (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

UNIT-I:
History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working), **Philosophy of the Indian Constitution:** Preamble**,** Salient Features.

UNIT-II:
Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality**,** Right to Freedom**,** Right against Exploitation**,** Right to Freedom of Religion**,** Cultural and Educational Rights**,** Right to Constitutional Remedies, Directive Principles of State Policy**,** Fundamental Duties.

UNIT-III:
Organs of Governance: Parliament**,** Composition**,** Qualifications and Disqualifications**,** Powers and Functions**,** Executive**,** President**,** Governor**,** Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

UNIT-IV:
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT-V:
Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

TEXT BOOKS/ REFERENCES:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Regulatory Affairs)

PEDAGOGY STUDIES (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Course Outcomes: Students will be able to understand:

- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

UNIT-I:

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

UNIT-II:

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT-III:

Evidence on the effectiveness of pedagogical practices, Methodology for the indepth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the scho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT-IV:

Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT-V:

Research gaps and future directions: Research design**,** Contexts**,** Pedagogy**,** Teacher education**,** Curriculum and assessment**,** Dissemination and research impact.

TEXT BOOKS/ REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.

3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Regulatory Affairs)

STRESS MANAGEMENT BY YOGA (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To achieve overall health of body and mind
- To overcome stress

Course Outcomes: Students will be able to:

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

UNIT-I:
Definitions of Eight parts of yog. (Ashtanga)

UNIT-II:
Yam and Niyam.

UNIT-III:
Do`s and Don't's in life.
i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT-IV:
Asan and Pranayam

UNIT-V:
i) Various yog poses and their benefits for mind & body
ii) Regularization of breathing techniques and its effects-Types of pranayam

TEXT BOOKS/ REFERENCES:

1. 'Yogic Asanas for Group Tarining-Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (Pharmaceutical Regulatory Affairs)

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS
(Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Course Outcomes: Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

UNIT-I:

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

UNIT-II:

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-III:

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT-IV:

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

UNIT-V:

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

TEXT BOOKS/ REFERENCES:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.PHARMACY (PHARMACY PRACTICE)

R19 COURSE STRUCTURE AND SYLLABUS
Effective from Academic Year 2019-20 Admitted Batch

I YEAR I Semester

Course Code	Course Title	L	T	P	Credits
Professional Core-I	Pharmacotherapeutics – I	3	0	0	3
Professional Core-II	Clinical Pharmacy Practice	3	0	0	3
Professional Elective-I	1. Clinical Toxicology 2. Hospital and Community Pharmacy 3. Clinical Research and Pharmacovigilance	3	0	0	3
Professional Elective-II	1. Molecular Biology 2. Advances in Preclinical Evaluation 3. Drug Regulatory Affairs	3	0	0	3
	Research methodology and IPR	2	0	0	2
Laboratory-I	Pharmacotherapeutics – I Lab	0	0	4	2
Laboratory-II	Clinical Pharmacy Practice Lab	0	0	4	2
Audit - I	Audit Course - I	2	0	0	0
	Total	**16**	**0**	**8**	**18**

I YEAR II Semester

Course Code	Course Title	L	T	P	Credits
Professional Core-III	Pharmacotherapeutics – II	3	0	0	3
Professional Core-IV	Clinical Pharmacokinetics and Drug monitoring	3	0	0	3
Professional Elective-III	1. Biopharmaceutics and Pharmacokinetics 2. Clinical Research 3. Quality use of Medicines	3	0	0	3
Professional Elective-IV	1. Principles of Drug Discovery 2. Cellular and molecular pharmacology 3. Nutraceuticals	3	0	0	3
Laboratory- III	Pharmacotherapeutics – II Lab	0	0	4	2
Laboratory- IV	Clinical Pharmacokinetics and Drug monitoring Lab	0	0	4	2
	Mini Project with Seminar	2	0	0	2
Audit - II	Audit Course- II	2	0	0	0
	Total	**16**	**0**	**8**	**18**

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II YEAR I Semester

Course Code	Course Title	L	T	P	Credits
Professional Elective-V	1. Biostatistics 2. Pharmacoepidemiology and Pharmacoeconomics 3. Phytopharmaceuticals	3	0	0	3
Open Elective	Open Elective	3	0	0	3
Dissertation	Dissertation Work Review - II	0	0	12	6
	Total	**6**	**0**	**12**	**12**

II YEAR II Semester

Course Code	Course Title	L	T	P	Credits
Dissertation	Dissertation Work Review - III	0	0	12	6
Dissertation	Dissertation Viva-Voce	0	0	28	14
	Total	**0**	**0**	**40**	**20**

***For Dissertation Work Review - I, Please refer 7.8 in R19 Academic Regulations.**

Audit Courses I & II:

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technological Learning
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (PHARMACY PRACTICE)
PHARMACOTHERAPEUTICS- I (Professional Core - I)

Course Objective: This course aims to enable the students to understand the different treatment approaches in managing various disease conditions. Also, it imparts knowledge and skills in optimizing drug therapy of a patient by individualizing the treatment plan through evidence-based medicines.

Course Outcome: Upon completion of this course it is expected that students shall be able to:

- Describe and explain the rationale for drug therapy
- Summarize the therapeutic approach for management of various disease conditions including reference to the latest available evidence
- Discuss the clinical controversies in drug therapy and evidence-based medicine
- Prepare individualized therapeutic plans based on diagnosis
- Identify the patient specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time- course of clinical and laboratory indices of therapeutic response and adverse effect/s). Etiopathogenesis and pharmacotherapy of diseases associated with following systems

UNIT- I

Cardiovascular system: Hypertension, Congestive cardiac failure, Acute coronary syndrome, Arrhythmias, Hyperlipidemias. Hematological diseases: Anemia, Deep vein thrombosis, Drug induced hematological disorders

UNIT- II

Respiratory system: Asthma, Chronic obstructive airways disease, Drug induced pulmonary diseases
Endocrine system: Diabetes, Thyroid diseases

UNIT- III

Gastrointestinal system: Peptic ulcer diseases, Reflux esophagitis, inflammatory bowel diseases, Jaundice, & hepatitis, Cirrhosis, Diarrhea and Constipation, Drug-induced liver disease

UNIT-IV

Bone and joint disorders: Rheumatoid arthritis, Osteoarthritis, Gout, Osteoporosis

UNIT-V

Dermatological Diseases: Psoriasis, Eczema and scabies, impetigo, drug induced skin disorders
Ophthalmology: Conjunctivitis, Glaucoma

REFERENCES:

1. Roger and Walker. Clinical Pharmacy and Therapeutics – Churchill Livingstone publication
2. Joseph T. Dipiro et al. Pharmacotherapy: A Pathophysiologic Approach-Appleton & Lange
3. Robins SL. Pathologic basis of disease -W.B. Saunders publication
4. Eric T. Herfindal. Clinical Pharmacy and Therapeutics- Williams and Wilkins Publication
5. Lloyd Young and Koda-Kimble MA Applied Therapeutics: The clinical Use of Drugs- Lippincott Williams and Wilkins
6. Chisholm- Burns Wells Schwinghammer Malone and Joseph P Dipiro. Pharmacotherapy Principles and practice-– McGraw Hill Publication
7. Carol Mattson Porth. Principles of Pathophysiology- Lippincott Williams and Wilkins
8. Harrison's. Principles of Internal Medicine - McGraw Hill
9. Relevant review articles from recent medical and pharmaceutical literature

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year I Sem (PHARMACY PRACTICE)

CLINICAL PHARMACY PRACTICE (Professional Core - II)

Course Objective: This course is designed to impart the basic knowledge and skills that are required to practice pharmacy including the provision of pharmaceutical care services to both healthcare professionals and patients in clinical settings.

Course Outcome: Upon completion of this course it is expected that students shall be able to:

- Understand the elements of pharmaceutical care and provide comprehensive patient care services
- Interpret the laboratory results to aid the clinical diagnosis of various disorders
- Provide integrated, critically analyzed medicine and poison information to enable healthcare professionals in the efficient patient management

UNIT- I

Introduction to Clinical Pharmacy: Definition, evolution and scope of clinical pharmacy, International and national scenario of clinical MPP, Pharmaceutical care Clinical Pharmacy Services: Ward round participation, Drug therapy review (Drug therapy monitoring including medication order review, chart endorsement, clinical review and pharmacist interventions)

UNIT - II

Clinical Pharmacy Services: Patient medication history interview, Basic concept of medicine and poison information services, Basic concept of pharmacovigilance, Hemovigilance, Materiovigilance and AEFI, Patient medication counseling, Drug utilization evaluation, Documentation of clinical pharmacy services, Quality assurance of clinical pharmacy services.

UNIT - III

Patient Data Analysis: Patient Data & Practice Skills: Patient's case history – its structure and significances in drug therapy management, Common medical abbreviations, and terminologies used in clinical practice, Communication skills: verbal and non-verbal communications, its applications in patient care services. Lab Data Interpretation: Hematological tests, Renal function tests, Liver function tests

UNIT - IV

Lab Data Interpretation: Tests associated with cardiac disorders, Pulmonary function tests, Thyroid function tests, Fluid and electrolyte balance, Microbiological culture sensitivity tests

UNIT - V

Medicines & Poison Information Services: Medicine Information Service: Definition and need for medicine information service, Medicine information resources, Systematic approach in answering medicine information queries, Preparation of verbal and written response, establishing a drug information centre. Poison Information Service: Definition, need, organization and functions of poison information centre.

REFERENCES

1. A Textbook of Clinical MPP – Essential concepts and skills –Parthasarathi G, Karin Nyfort-Hansen and Milap Nahata
2. Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia
3. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc

4. Thomas J Johnson, Critical Care Pharmacotherapeutics
5. Collen D L, Sneha B S, Fundamental Skills for Patient Care in MPP
6. Patient Assessment in Pharmacy, by Yolanda M H
7. Relevant review articles from recent medical and pharmaceutical literature

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year I Sem (PHARMACY PRACTICE)
CLINICAL TOXICOLOGY (Professional Elective – I)

Course Objective: In the current scenario of accidental, homicidal and suicidal excessive consumption of drugs, pesticides, heavy metals and other poisonings, this elective helps the students to acquire the required knowledge and skills in the management of poisoning.

Course Outcome: At the end of the course the student is equipped with handling the first aid, elimination enhancement and treatment of poisoning and supportive care in poisoning due to

- Pesticides
- Drug over usage
- Heavy metals
- Radiation
- Snakes and anthropod bites
- Food poisoning

The student also gains knowledge in substance abuse and treatment of drug dependence.

UNIT I

General principles involved in the management of poisoning, antidotes and the clinical applications.

UNIT II

Supportive care in clinical toxicology. Gut decontamination, elimination enhancement and toxicokinetics.

UNIT III

Clinical symptoms and management of acute poisoning with the following agents –

a) Pesticide poisoning: organophosphorus compounds, carbamates, organochlorines, pyrethroids. b) Opiates overdose. c) Antidepressants d) Barbiturates and benzodiazepines. e) Alcohol: ethanol, methanol. f) Paracetamol and salicylates. g) Non-steroidal anti-inflammatory drugs. h) Hydrocarbons: Petroleum products and PEG. i) Caustics: inorganic acids and alkalis. j) Radiation poisoning

UNIT IV

Clinical symptoms and management of chronic poisoning with the following agents –

a) Heavy metals: Arsenic, lead, mercury, iron, copper b) Venomous snake bites: Families of venomous snakes, clinical effects of venoms, general management as first aid, early manifestations, complications and snake bite injuries. c) Plants poisoning. Mushrooms, Mycotoxins. d) Food poisonings e) Envenomations – Arthropod bites and stings.

UNIT V

Substance abuse: Signs and symptoms of substance abuse and treatment of dependence

a) CNS stimulants: amphetamine
b) Opioids
c) CNS depressants
d) Hallucinogens: LSD
e) Cannabis group
f) Tobacco

REFERENCES:

1. Matthew j ellenhorn. Ellenhorns medical toxicology – diagnosis and treatment of poisoning. Second edition. Williams and willkins publication, london b.
2. 2. V V Pillay. Handbook of forensic medicine and toxicology. Thirteenth edition 2003 paras publication, Hyderabad

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year I Sem (PHARMACY PRACTICE)

HOSPITAL & COMMUNITY PHARMACY (Professional Elective - I)

Course Objective: This course is designed to impart basic knowledge and skills that are required to practice pharmacy in both hospital and community settings.

Course Outcome: Upon completion of this course it is expected that students shall be able to:

- Understand the organizational structure of hospital pharmacy
- Understand drug policy and drug committees
- Know about procurement & drug distribution practices
- Know the admixtures of radiopharmaceuticals Understand the community pharmacy management
- Know about value added services in community pharmacies

UNIT- I

Introduction to Hospitals: Definition, classification, organizational structure Hospital Pharmacy: Definition, Relationship of hospital pharmacy department with other departments, Organizational structure, legal requirements, work load statistics, Infrastructural requirements, Hospital Pharmacy Budget and Hospital Pharmacy management Hospital Drug Policy: Pharmacy & Therapeutics Committee, Infection Control committee, Research & Ethics Committee, Management of Medicines as per NABH

UNIT- II

Hospital Formulary Guidelines: And its development, Developing Therapeutic guidelines, Drug procurement process, and methods of Inventory control, Methods of Drug distribution, Intravenous admixtures, Hospital Waste Management

UNIT- III

Education and training: Training of technical staff, training and continuing education for pharmacists, Pharmacy students, Medical staff and students, Nursing staff and students, Formal and informal meetings and lectures, Drug and therapeutics newsletter. Community MPP: Definition, roles & responsibilities of community pharmacists, and their relationship with other health care providers. Community Pharmacy management: Legal requirements to start community pharmacy, site selection, lay out & design, drug display, super drug store model, accounts and audits, Good dispensing practices, Different softwares & databases used in community pharmacies. Entrepreneurship in community pharmacy.

UNIT- IV

Prescription: Legal requirements & interpretation, prescription related problems Responding to symptoms of minor ailments: Head ache, pyrexia, menstrual pains, food and drug allergy, OTC medication: Rational use of over the counter medications Medication counseling and use of patient information leaflets Medication adherence – Definition, factors influencing adherence behavior, strategies to improve medication adherence Patient referrals to the doctors ADR monitoring in community pharmacies

UNIT- V

Health Promotion: Definition and health promotion activities, family planning, Health screening services, first aid, prevention of communicable and non-communicable diseases, smoking cessation, Child & mother care. National Health Programs- Role of Community Pharmacist in Malaria and TB

control programs Home Medicines review program – Definition, objectives, Guidelines, method and outcomes Research in community MPP

REFERENCES

1. Hospital Pharmacy - Hassan WE. Lea and Febiger publication.
2. Textbook of hospital pharmacy - Allwood MC and Blackwell.
3. Avery's Drug Treatment, Adis International Limited.
4. Community MPP – Ramesh Adepu, BSP Publishers, Hyderabad
5. Remington Pharmaceutical Sciences.
6. Relevant review articles from recent medical and pharmaceutical literature

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year I Sem (PHARMACY PRACTICE)

CLINICAL RESEARCH AND PHARMACOVIGILANCE (Professional Elective - I)

Course Objectives: This subject will provide a value addition and current requirement for the students in clinical research and pharmacovigilance. It will teach the students on conceptualizing, designing, conducting, managing and reporting of clinical trials. This subject also focuses on global scenario of pharmacovigilance in different methods that can be used to generate safety data. It will teach the students in developing drug safety data in pre-clinical, clinical phases of drug development and post market surveillance.

Course Outcomes: Upon completion of the course, the student shall be able to;

- explain the regulatory requirements for conducting clinical trial
- Demonstrate the types of clinical trial designs
- Explain the responsibilities of key players involved in clinical trials
- Execute safety monitoring, reporting and close-out activities
- Explain the principles of Pharmacovigilance
- Detect new adverse drug reactions and their assessment
- Perform the adverse drug reaction reporting systems and communication in pharmacovigilance

UNIT - I
Regulatory Perspectives of Clinical Trials:
Origin and Principles of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines Ethical Committee: Institutional Review Board, Ethical Guidelines for Biomedical Research and Human Participant-Schedule Y, ICMR, Informed Consent Process: Structure and content of an Informed Consent Process Ethical principles governing informed consent process

UNIT - II
Clinical Trials: Types and Design:
Experimental Study- RCT and Non RCT, Observation Study: Cohort, Case Control, Cross sectional Clinical Trial Study Team Roles and responsibilities of Clinical Trial Personnel: Investigator, Study Coordinator, Sponsor, Contract Research Organization and its management.

UNIT - III
Clinical Trial Documentation:
Guidelines to the preparation of documents, Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study Report Clinical Trial Monitoring-Safety Monitoring in CT Adverse Drug Reactions: Definition and types. Detection and reporting methods. Severity and seriousness assessment. predictability and preventability assessment. Management of adverse drug reactions; Terminologies of ADR.

UNIT - IV
Basic aspects, terminologies and establishment of pharmacovigilance:
History and progress of pharmacovigilance, Significance of safety monitoring, Pharmacovigilance in India and international aspects, WHO international drug monitoring Program, WHO and Regulatory terminologies of ADR, evaluation of medication safety, establishing pharmacovigilance centres in Hospitals, Industry and National Programs related to pharmacovigilance. Roles and responsibilities in Pharmacovigilance.

UNIT - V

Methods, ADR reporting and tools used in pharmacovigilance:

International classification of diseases, International Nonproprietary names for drugs, Passive and Active surveillance, Comparative observational studies, Targeted clinical investigations and Vaccine safety surveillance. Spontaneous reporting system and Reporting to regulatory authorities, Guidelines for ADRs reporting. Argus, Aris G Pharmacovigilance, VigiFlow, Statistical methods for evaluating medication safety
data.

REFERENCES:

1. Central Drugs Standard Control Organization- Good Clinical Practices, Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
2. International Conference on Harmonization of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonized Tripartite Guideline. Guideline for Good Clinical Practice. E6; May 1996.230
3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
5. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
6. Handbook of clinical Research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone.
7. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
8. Textbook of Pharmacovigilance: Concept and Practice. G.P. Mohanta and P. K. Manna. 2016, Pharma Med Press.
9. A textbook of Clinical Pharmacy Practice: Essential Concepts and Skills. Second Edition, 2012, University Press

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Princeton College of Pharmacy,
Kommula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year I Sem (PHARMACY PRACTICE)

MOLECULAR BIOLOGY (Professional Elective - II)

Course Objective: This subject will provide the knowledge about nucleic acid-DNA and RNA structures, DNA Topology, organization of DNA into chromosomes, mutation problems. This subject also provides knowledge about transcription and translation processes occur in molecular biology.

Course Outcome: Upon completion of the course, the student shall be able to, know about total molecular biology with structures, chromosomes arrangement, the processes occur in cell, synthesis and processing of prokaryotic and eukaryotic transcripts. Transport of RNA within eukaryotic cell. Regulatory elements of genes-promoters.

UNIT - I
Introduction to Molecular biology
Nucleic acids - DNA and RNA structure and functions, DNA as genetic material. Griffth, Avery-McCarty-MCLeod, Hershy- Chase, Franklin Conrat Experiments
DNA Structure: Chemistry of DNA, Forces stabilizing DNA structure, Helix parameters, Forms of DNA (A,B,C,D,T and Z), Watson – Crick and Hoogsteen base pairing , Physical Properties of ds DNA (UV absorption spectra Denaturation and renaturation), Chemical that react with DNA.

UNIT - II
DNA topology: DNA supercoiling, Supercoiled form of DNA, Super helical density, Energetic of supercoiled DNA, Biology of supercoiled DNA (Topological domain of DNA, DNA topoisomerases, Mechanisms of supercoiling in cells, mechanisms of action of topoisomerase I and II, effect of supercoiling on structure of DNA and role of supercoiling in gene expression and DNA replication).

Organization of DNA into chromosomes: Packaging of DNA and organization of chromosome in bacteria and eukaryotic cells; packaging of DNA in eukaryotic nucleosome and chromatin condensation assembly of nucleosomes upon replication. Chromatin modification and genome expression.

UNIT - III
Mutations- molecular mechanism - types of DNA mutations and its significance. DNA repair - repair mechanisms - need of DNA repairs, DNA recombination – molecular mechanism of recombination-relationship between repair and recombination, SOS mechanism. Proteins and enzymes involved DNA repair and recombination.
DNA – Protein Interactions: General features interaction of Helix- turn Helix motif, B sheet, Zn- DNA binding domain etc with DNA.

UNIT - IV
DNA Replication: Mechanism of DNA polymerase catalyzed synthesis of DNA, types of DNA polymerases in bacteria and their role. Initiation of chromosomal DNA replication and its regulation in prokaryotes assembly of replisome and progress of replication fork, termination of replication. Types and function of eukaryotic DNA polymerases initiation of replication in eukaryotes, role of telomerases in replication of eukaryotic chromosomes. Inhibitor of DNA replication (Blocking precursor synthesis nucleotide polymerization, altering DNA structure).

Transcription: RNA polymerases, features of prokaryotic and eukaryotic promoters. Strong and weak promoters. Assembly of transcription initiation complex in prokaryotes and eukaryotes and its

regulation; synthesis and processing of prokaryotic and eukaryotic transcripts. Transport of RNA within eukaryotic cell. Regulatory elements of genes-promoters. Fate of mRNA.

UNIT 5

Translation- Synthesis and Processing of Proteome: Structure and role of tRNA in protein synthesis, ribosome structure, basic feature of genetic code and its deciphering, translation (initiation, elongation and termination in detail in prokaryotes as well as eukaryotes), Post translational processing of protein (protein folding, processing by proteolytic cleavage, processing by chemical modification, inteins). Protein degradation.

Regulation of Gene expression in prokaryotes and eukaryotes: Positive and negative regulation. lac-, ara-, his- and trp- operon regulation; antitermination, global regulatory responses; Regulation of gene expression in eukaryotes: Transcriptional, translational and processing level control mechanisms.

DNA- transposable elements- types of transposable elements, its importance in variation and evolution. Possible origin of virus, Oncogenes.

REFERENCES:

1. Cell & Molecular Biology: Cell and Molecular Biology: Concepts and Experiments, Gerald Karp, John Wiley, NY
2. Molecular Cell Biology, H.S. Bramrah, Anmol Publications Pvt. Ltd., New Delhi
3. Advanced Molecular Biology, H.S. Bhamrah Viva Books, Pvt. Ltd., New Delhi
4. Plant Biochemistry and Molecular Biology, Hans Walter Held, Oxford, NY
5. Molecular Biology of the Gene, Watson, Baker, Bell, Gann Levine, Losick, Pearson Education Pvt. Ltd., New Delhi
6. Essential Molecular Biology: A Practical Approach, TA Brown, oxford.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year I Sem (PHARMACY PRACTICE)

ADVANCES IN PRECLINICAL EVALUATION – I (Professional Elective-II)

Course Objective: This course is designed to impart basic knowledge and skills that are required animals and their regulatory requirements. The students will know about screening programmes, preclinical and clinical models to perform activities.

Course Outcome: Upon completion of this course it is expected that students shall be able to:

- Understand the care and handling experimental animals
- Understand drug rules and regulations for conducting animal studies
- Know about preclinical & clinical studies of different ANS drugs and their models.

UNIT - I

Care, handling and breeding techniques of laboratory animals. Regulations for laboratory animal care and ethical requirement. Knowledge of the CPCSEA proforma for performing experiments on animals.

UNIT - II

Organization of preclinical screening programme (Blind screening)

UNIT - III

Drug discovery process: Principles, techniques and strategies used in drug discovery. High throughput screening, human genomics.

UNIT - IV

Preclinical and clinical models employed in the screening of new drugs belonging to following categories.

1. Drugs acting on Autonomic nervous system: Sympathomimetics, Parasympathomimetics, Anticholinesterages, anticholinergics, adrenolytics. Muscle relaxants (peripheral)
2. Cardiovascular Pharmacology: Cardiac glycosides, antiarrhythmics, antihypertensives, antiatherosclerotics.
3. Screening of free radical scavenging activity
4. Immunopharmacology: Specific (Cell and humoral mediated) and non-specific methods.
5. Drugs for metabolic disorders: Anti-diabetic agents, Hepatoprotective agents, Anti-hyperlipidemic agents

UNIT - V

Principles of Toxicological evaluations, ED 50, LD50 and TD values, acute, sub-acute and chronictoxicity studies.

REFERENCES

1. Biological standardization by J. H. Burn D.J. Finney and I.G. Goodwin
2. Screening methods in Pharmacology by Robert Turner. A
3. Evaluation of drugs activities by Laurence and Bachrach
4. Methods in Pharmacology by Arnold Schwartz.
5. Fundamentals of experimental Pharmacology by M. N. Ghosh
6. Pharmacological experiment on intact preparations by Churchill Livingstone
7. Drug discovery and Evaluation by Vogel H.G.
8. Experimental Pharmacology by R. K. Goyal.
9. Preclinical evaluation of new drugs by S. K. Guta
10. Handbook of Experimental Pharmacology, S K. Kulkarni

11. Practical Pharmacology and Clinical Pharmacy, S K. Kulkarni, 3rd Edition.
12. David R. Gross. Animal Models in Cardiovascular Research, 2nd Edition, Kluwer Academic Publishers, London, UK.
13. Screening Methods in Pharmacology, Robert A. Turner.
14. Rodents for Pharmacological Experiments, Dr. Tapan Kumar chatterjee.
15. Practical Manual of Experimental and Clinical Pharmacology by Bikash Medhi (Author), Ajay Prakash (Author)

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year I Sem (PHARMACY PRACTICE)

DRUG REGULATORY AFFAIRS (Professional Elective - II)

Course Objective: The topics which are present in the Drug regulatory affairs are very much useful which increases the knowledge regarding the regulatory aspects in the pharmaceutical industries.

Course Outcome:

- Students will come to know the different competent regulatory authorities globally.
- Students be aware of technical aspects pertaining to the marketing authorization application (MAA)
- The regulatory guidelines and directions framed by the regulatory authorities will be helpful to place the drug products in market for marketing approvals.

UNIT - I

Drug Regulatory Aspects (India)

1. Indian drug regulatory authorities, Central and State regulatory bodies (FDA)
2. Drugs and Cosmmetics Act and Rules with latest Amendments (Selective)
3. Special emphasis – Schedule M and Y
4. New drugs – Importation, Registration, development, Clinical Trials, BE NOC & BE studies
5. Various Licences – Test Lic., Import lic., for testing of drugs and API's, Manufacturing Contract and Loan licence manufacturing.

UNIT - II

Good Manufacturing Practices (GMP)

1. Indian GMP certification, WHO GMP certification.
2. ICH guidelines for stability testing and other relevant ones (Q1-Q10)
3. Export permissions and manufacturing for semi-regulated countries
4. Understanding of the plant layouts with special emphasis on the environment & safety (HVAC, Water Systems, Stores Management, Effluent etc.)
5. Quality Assurance and Qulaity Control – Basic understanding for in-built quality.

UNIT - III

A detailed study of regulatory aspects that affect drug product design, manufacture and distribution in a developed country such as USA and in a developing country such as Brazil, Hatch Waxmann Act; Bolar Provisions and other FDA Regulations. Regulatory aspects of pharmaceutical and bulk drug manufacture, regulatory drug analysis.

UNIT - IV

Documentation related to manufacturing, cleaning methods, retention samples and records, quality control, batch release documents, distribution records, complaints and recalls.
Quality, safety and legislation for cosmetic products and herbal products.

UNIT - V

Governing Regulatory Bodies across the globe.

Country Authority Submission

a. U.S Food & Drug Administration USDMF
b. Canada Therapeutic Product Directorate DMF
c. Europe
   1) European Medicines Agency (EMEA/ National Authorities) EDMF
   2) European Directorate for Quality of Medicines CEP/COS & Health Care Products.

3) MHRA – Medicines and Health Care Products Regulatory Agency

d. Product Filing
e. Responding Regulatory Deficiencies
f. Final Approval Procedure

Preparation, review and submission of Drug Master Files to Regulatory Authorities as per their specific requirements.

TEXT AND REFERENCE BOOKS:

1. Original laws published by Govt. of India.
2. Text Book of Forensic Pharmacy by Mithal B. M.; Vallabh Prakashan, New Delhi.
3. Laws of Drugs in India by Hussain.
4. Text Book of Forensic Pharmacy by Jain N. K.; Vallabh Prakashan, New Delhi.
5. Pharmaceutical Regulatory Affairs - Selected Topics , CVS Subramanyam and J Thimmasetty, Vallabh Prakashan Delhi - 2013

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year I Sem (PHARMACY PRACTICE)

RESEARCH METHODOLOGY AND IPR

Course Objectives:

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

Course Outcomes: At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT - I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT - II

Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT - III

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT - IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT - V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

REFERENCES:

1. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
2. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
3. Mayall, “Industrial Design”, McGraw Hill, 1992.
4. Niebel, “Product Design”, McGraw Hill, 1974.
5. Asimov, “Introduction to Design”, Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New
7. Technological Age”, 2016.
8. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year I Sem (PHARMACY PRACTICE)

PHARMACOTHERAPEUTICS LAB - I (Laboratory - I)

The students are required to be posted to various clinical wards for their exposure with therapeutic management and other clinical aspects. They are expected to have experience and do a tutorial as well as case presentation in the following clinical conditions. The students have to make at least 10 case presentations covering most common diseases found in the hospital to which the college is attached. The student should also submit a record of the cases presented. The list of clinical cases presented should include follow-up of the clinical cases mentioned below from the day of admission till discharge and presented in the SOAP (Subjective, Objective, Assessment and Plan) format.

a) The cases may be selected from the following Wards:
   - Gastroenterology
   - Cardiology
   - Pulmonology
   - Orthopedics
   - Endocrinology
   - Dermatology

b) Rational use of medicines in special population admitted in above wards (three)

c) Calculation of Bioavailability and Bioequivalence from the given data (two)

d) Interpretation of Therapeutic Drug Monitoring reports of a given patient of any of the above wards (three)

e) Calculation of various Pharmacoeconomic outcome analysis for the given data from the above (two) Assignments The students are required to submit a minimum of three written assignments (1500 to 2000 words) selected from the topics on different disease conditions given to them. The students are required to discuss both the clinical and therapeutic aspects in the same.

REFERENCES:

1. Roger and Walker. Clinical Pharmacy and Therapeutics – Churchill Livingstone publication
2. Joseph T. Dipiro et al. Pharmacotherapy: A Pathophysiologic Approach-Appleton & Lange
3. Robins SL. Pathologic basis of disease -W.B. Saunders publication
4. Eric T. Herfindal. Clinical Pharmacy and Therapeutics- Williams and Wilkins Publication
5. Lloyd Young and Koda-Kimble MA Applied Therapeutics: The clinical Use of Drugs- Lippincott Williams and Wilkins
6. Chisholm- Burns Wells Schwinghammer Malone and Joseph P Dipiro. Pharmacotherapy Principles and practice-– McGraw Hill Publication

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year I Sem (PHARMACY PRACTICE)

CLINICAL PHARMACY PRACTICE LAB (Laboratory - II)

List of Experiments:

1. Treatment Chart Review (one)
2. Medication History Interview (one)
3. Patient Medication Counseling (two)
4. Drug Information Query (two)
5. Poison Information Query (one)
6. Lab Data Interpretation (two)
7. Presentation of clinical cases of various disease conditions adopting Pharmaceutical Care Plan Model (eight)
8. ABC Analysis of a given list of medications (one)
9. Preparation of content of a medicine, with proper justification, for the inclusion in the hospital formulary (one)
10. Formulation and dispensing of a given IV admixtures (one)
11. Preparation of a patient information leaflet (two)
12. Preparation of Study Protocol (one)
13. Preparation of Informed Consent Form (one)

REFERENCES

1. Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia
2. Thomas J Johnson, Critical Care Pharmacotherapeutics
3. Collen D L, Sneha B S, Fundamental Skills for Patient Care in MPP
4. Patient Assessment in Pharmacy, by Yolanda M H
5. Relevant review articles from recent medical and pharmaceutical literature

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year II Sem (PHARMACY PRACTICE)

PHARMACOTHERAPEUTICS - II (Professional Core - III)

Course Objective: This course aims to enable the students to understand the different treatment approaches in managing various disease conditions. Also, it imparts knowledge and skills in optimizing drug therapy of a patient by individualizing the treatment plan through evidence-based medicines.

Course Outcome: Upon completion of this course it is expected that students shall be able to: - Describe and explain the rationale for drug therapy - Summarize the therapeutic approach for management of various disease conditions including reference to the latest available evidence - Discuss the clinical controversies in drug therapy and evidence based medicine - Prepare individualized therapeutic plans based on diagnosis - Identify the patient specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time- course of clinical and laboratory indices of therapeutic response and adverse effect/s)

UNIT I
Nervous system: Epilepsy, Parkinson's disease, Stroke, Headache, Alzheimer's disease, Neuralgias and Pain pathways and Pain management.

UNIT II
Psychiatric disorders: Schizophrenia, Depression, Anxiety disorders, Sleep disorders, Drug induced psychiatric disorders
Renal system: Acute renal failure, Chronic renal failure, Renal dialysis, Drug induced renal disease

UNIT III
Infectious diseases: General guidelines for the rational use of antibiotics and surgical prophylaxis, Urinary tract infections, Respiratory tract infections, Gastroenteritis, Tuberculosis, Malaria, Bacterial endocarditis, Septicemia.

UNIT IV
Infectious diseases: Meningitis, HIV and opportunistic infections, Rheumatic fever, Dengue fever, H1N1, Helmenthiasis, Fungal infections. Gynecological disorders: Dysmenorrhea, Hormone replacement therapy.

UNIT V
Oncology: General principles of cancer chemotherapy, pharmacotherapy of breast cancer, lung cancer, head & neck cancer, hematological malignancies, Management of nausea and vomiting, Palliative care

REFERENCES:

1. Roger and Walker. Clinical Pharmacy and Therapeutics – Churchill Livingstone publication.
2. Joseph T. Dipiro et al. Pharmacotherapy: A Pathophysiologic Approach-Appleton & Lange
3. Robins SL. Pathologic basis of disease -W. B. Saunders publication
4. Eric T. Herfindal. Clinical Pharmacy and Therapeutics- Williams and Wilkins Publication
5. Lloyd Young and Koda-Kimble MA Applied Therapeutics: The clinical Use of Drugs- Lippincott Williams and Wilkins
6. Chisholm - Burns Wells Schwinghammer Malone and Joseph P Dipiro. Pharmacotherapy Principles and practice-– McGraw Hill Publication
7. Carol Mattson Porth. Principles of Pathophysiology- Lippincott Williams and Wilkins

8. Harrison's. Principles of Internal Medicine - McGraw Hill
9. Relevant review articles from recent medical and pharmaceutical literature

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year II Sem (PHARMACY PRACTICE)

CLINICAL PHARMACOKINETICS AND DRUG MONITORING (Professional Core - IV)

Course Objective: This course is designed to enable students to understand the basics principles and applications of pharmacokinetics in designing the individualized dosage regimen, to interpret the plasma drug concentration profile in altered pharmacokinetics, drug interactions and in therapeutic drug monitoring processes to optimize the drug dosage regimen. Also, it enables students to understand the basic concepts of pharmacogenetics, pharmacometrics for modeling and simulation of in kinetic data.

Course Outcome: Upon completion of this course it is expected that students shall be able to:

- Design the drug dosage regimen for individual patients
- Interpret and correlate the plasma drug concentrations with patients' therapeutic outcomes Recommend dosage adjustment for patients with renal/ hepatic impairment Recommend dosage adjustment for pediatrics and geriatrics
- Manage pharmacokinetic drug interactions
- Apply pharmacokinetic parameters in clinical settings
- Interpret the impact of genetic polymorphisms of individuals on pharmacokinetics and or pharmacodynamics of drugs
- Do pharmacokinetic modeling for the given data using the principles of pharmacometrics

UNIT - I

Introduction to Clinical pharmacokinetics: Compartmental and Non-compartmental models, Renal and non-renal clearance, Organ extraction and models of hepatic clearance, Estimation and determinants of bioavailability, Multiple dosing, Calculation of loading and maintenance doses.

Designing of dosage regimens: Determination of dose and dosing intervals, Conversion from intravenous to oral dosing, Nomograms and Tabulations in designing dosage regimen.

UNIT - II

Pharmacokinetics of Drug Interaction: Pharmacokinetic drug interactions, Inhibition and Induction of Drug metabolism, Inhibition of Biliary Excretion.

Pharmacogenetics: Genetic polymorphism in Drug metabolism: Cytochrome P-450 Isoenzymes, Genetic Polymorphism in Drug Transport and Drug Targets, Pharmacogenetics and Pharmacokinetic/ Pharmacodynamic considerations.

Introduction to Pharmacometrics: Introduction to Bayesian Theory, Adaptive method or Dosing with feedback, Analysis of Population pharmacokinetic Data.

UNIT - III

Non-Linear Mixed Effects Modelling: The Structural or Base Model, Modeling Random Effects, Modeling Covariate Relationships, Mixture Model, Estimation Methods, Model Building Techniques, Covariate Screening Methods, Testing the model assumptions, Precision of the parameter estimates and confidence intervals, Model misspecification and violation of the model assumptions, Model Validation, Simulation of dosing regimens and dosing recommendations, Pharmacometrics software.

UNIT - IV

Altered Pharmacokinetics: Drug dosing in the elderly, Drug dosing in the pediatrics, Drug dosing in the obese patients, Drug dosing in the pregnancy and lactation, Drug dosing in the renal failure and extracorporeal removal of drugs, Drug dosing in the in hepatic failure.

UNIT - V

Therapeutic Drug monitoring: Introduction, Individualization of drug dosage regimen (Variability – Genetic, age, weight, disease and Interacting drugs), Indications for TDM, Protocol for TDM, Pharmacokinetic/Pharmacodynamic Correlation in drug therapy.

TDM of drugs used in the following conditions:

Cardiovascular disease: Digoxin, Lidocaine, Amiodarone;
Seizure disorders: Phenytoin, Carbamazepine, Sodium Valproate;
Psychiatric conditions: Lithium, Fluoxetine, Amitriptyline;
Organ transplantations: Cyclosporine;
Cytotoxic Agents: Methotrexate, 5-FU, Cisplatin;
Antibiotics: Vancomycin, Gentamicin, Meropenem.

REFERENCES:

1. Leon Shargel, Susanna Wu-Pong, Andrew Yu. Applied Biopharmaceutics & Pharmacokinetics. New York: McGraw Hill.
2. Peter L. Bonate. Pharmacokinetic - Pharmacodynamic Modeling and Simulation. Springer Publications.
3. Michael E. Burton, Leslie M. Shaw, Jerome J. Schentag, William E. Evans. Applied Pharmacokinetics & Pharmacodynamics: Principles of Therapeutic Drug Monitoring. lippincott Williams & Wilkins.
4. Steven How-Yan Wong, Irving Sunshine. Handbook of Analytical Therapeutic Drug Monitoring and Toxicology. CRC Press, USA.
5. Soraya Dhillon, Andrzej Kostrzewski. Clinical pharmacokinetics. 1st edition. London: Pharmaceutical Press.
6. Joseph T. Dipiro, William J. Spruill, William E. Wade, Robert A. Blouin and Jane M. Pruemer Concepts in Clinical Pharmacokinetics. American Society of Health-System Pharmacists, USA.
7. Malcolm Rowland, Thomas N. Tozer. Clinical Pharmacokinetics and pharmacodynamics: concepts and applications. lippincott Williams &Wilkins, USA.
8. Evans, Schentag, Jusko. Applied pharmacokinetics. American Society of Health system Pharmacists, USA.
9. Michael E. Winter. Basic Clinical Pharmacokinetics. lippincott Williams &Wilkins, USA.
10. Milo Gibaldi. Biopharmaceutics and Clinical Pharmacokinetics. Pharma Book Syndicate, USA.
11. Dhillon and Kostrzewski. Clinical pharmacokinetics. Pharmaceutical Press, London.
12. John E. Murphy. Clinical Pharmacokinetics. 5th edition. US: American Society of Health-System Pharmacist, USA.
13. Relevant review articles from recent medical and pharmaceutical literature

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year II Sem (PHARMACY PRACTICE)

BIOPHARMACEUTICS AND PHARMACOKINETICS (Professional Elective - III)

Course Objective: This course is designed to impart basic knowledge about biopharmaceutics, drug ADME process, kinetic modeling and distribution of drug. T

Course Outcome: Upon completion of this course it is expected that students shall be able to: Understand the organizational structure of hospital pharmacy Understand drug policy and drug committees Know about procurement & drug distribution practices Know the admixtures of radiopharmaceuticals Understand the community pharmacy management Know about value added services in community pharmacies

UNIT - I

Introduction to Biopharmaceutics

I. Absorption of drugs from gastrointestinal tract.
II. Drug Distribution.
III. Drug Elimination.

UNIT - II

Introduction to Pharmacokinetics.

a. Mathematical model
b. Drug levels in blood.
c. Pharmacokinetic model
d. Compartment models
e. Pharmacokinetic study.

UNIT-III

One compartment and Multicompartment models.

a. Intravenous Injection (Bolus)
b. Intravenous infusion.
c. Two compartment open model.
d. IV bolus, IV infusion and oral administration

UNIT-IV

Nonlinear Pharmacokinetics.

a. Introduction
b. Factors causing Non-linearity.
c. Michaelis-menton method of estimating parameters.

UNIT-V

Bioavailability and Bioequivalence.

a. Introduction.
b. Bioavailability study protocol.
c. Methods of Assessment of Bioavailability

TEXT BOOKS:

1. Biopharmaceutics and Clinical Pharmacokinetics by Milo Gibaldi.
2. Learn Shargel and ABC yu, Applied Biopharmacokinetics and
3. Biopharmaceutics and Pharmacokinetics by C.V.S. Subrahmanyam, Vallabh Prakashan.2010.

4. Basic biopharmaceutics, Sulnil S. Jambhekar and Philip J Brean.
5. Text book of Biopharmaceutics and Clinical Pharmacokinetics by Niazi Sarfaraz
6. Bio-Pharmaceutics and Pharmacokinetics by V. Venkateshwarlu.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year II Sem (PHARMACY PRACTICE)
CLINICAL RESEARCH (Professional Elective - III)

Course Objective: This subject will provide different approaches to drug discovery, pharmacological, toxicological and new drug applications. It will also impart knowledge about clinical trials, ICH guidelines and their implementation, rules and regulations of GCP, CDSCO and different protocols.

Course Outcome: Upon completion of the course, the student shall be able to,

- know approaches for drug discovery, Explain the regulatory requirements for conducting clinical trial
- Demonstrate the types of clinical trial designs
- Explain the responsibilities of key players involved in clinical trials
- know the regulations of GCP, ICH and different protocols.

UNIT - I

Drug development process: Introduction, Various Approaches to drug discovery, Pharmacological, Toxicological, IND Application, Drug characterization & Dosage form

UNIT - II

Clinical development of drug: a. Introduction to Clinical trials b. Various phases of clinical trial. c. Methods of post marketing surveillance d. Abbreviated New Drug Application submission.

UNIT - III

Good Clinical Practice – ICH, GCP, Central drug standard control organisation (CDSCO) guidelines, Challenges in the implementation of guidelines

UNIT - IV

Ethical guidelines in Clinical Research, Composition, responsibilities, procedures of IRB / IEC

UNIT - V

Role and responsibilities of clinical trial personnel as per ICH GCP a. Sponsor b. Investigators c. Clinical research associate d. Auditors e. Contract research coordinators f. Regulatory authority

a. Designing of clinical study documents (protocol, CRF, ICF, PIC with assignment)
b. Informed consent Process
c. Safety monitoring in clinical trials.

REFERENCES:

1. Central Drugs Standard Control Organization. Good Clinical Practices-Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
2. International Conference on Harmonisation of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonised Tripartite Guideline. Guideline for Good Clinical Practice.E6; May 1996.
3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
5. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
6. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
7. Goodman & Gilman: JG Hardman, LE Limbard, 10th Edn. McGraw Hill Publications, 2001.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year II Sem (PHARMACY PRACTICE)

QUALITY USE OF MEDICINES (Professional Elective - III)

Course objectives: This course is designed to impart basic knowledge and skills that are required to practice quality use of medicines (QUM) in different healthcare settings and also to promote quality use of medicines, in clinical practice, through evidence-based medicine approach.

Course Outcomes: Upon completion of this course itis expected that students shall be able to:

- Understand the principles of quality use of medicines
- Know the benefits and risks associated with use of medicines
- Understand regulatory aspects of quality use of medicines
- Identify and resolve medication related problems
- Promote quality use of medicines
- Practice evidence-based medicines

UNIT - I

Introduction to Quality use of medicines (QUM): Definition and Principles of QUM, Key partners and responsibilities of the partners, Building blocks in QMC, Evaluation process in QMC, Communication in QUM, Cost effective prescribing.

UNIT - II

Concepts in QUM Evidence based medicine: Definition, concept of evidence-based medicine, Approach and practice of evidence-based medicine inclinical settings Essential drugs: Definition, need, concept of essential drug, National essential drug policy and list Rational drug use: Definition, concept and need for rational drug use, Rational drug prescribing, Role of pharmacist in rational drug use.

UNIT - III

QUM in various settings: Hospital settings, Ambulatory care/Residential care, Role of health care professionals in promoting the QUM, Strategies to promote the QUM, Impact of QUM on E-health, integrative medicine and multidisciplinary care. QUM in special population: Pediatric prescribing, Geriatric prescribing, Prescribing in pregnancy and lactation, Prescribing in immune compromised and organ failure patients.

UNIT - IV

Regulatory aspects of QUM in India: Regulation including scheduling, Regulation of complementary medicines, Regulation of OTC medicines, Professional responsibility of pharmacist, Role of industry in QUM in medicine development.

UNIT - V

Medication errors: Definition, categorization and causes of medication errors, Detection and prevention of medication errors, Role of pharmacist in monitoring and management of medication errors Pharmacovigilance: Definition, aims and need for pharmacovigilance, Types, predisposing factors and mechanism of adverse drug reactions (ADRs), Detection, reporting and monitoring of ADRs, Causality assessment of ADRs, Management of ADRs, Role of pharmacist in pharmacovigilance.

REFERENCES:

1. A Textbook of Clinical Pharmacy Practice– Essential concepts and skills– Parthasarathi G, Karin Nyfort-Hansen and Milap Nahata

2. Andrews E B, Moore N. Mann's Pharmacovigilance
3. Dipiro JT, Talbert RL, Yee GC. Pharmacotherapy: A Pathophysiologic Approach
4. Straus SE, Richardson WS, Glasziou P, Haynes RB. Evidence-Based Medicine: How to practice and teach it
5. Cohen M R. Medication Errors
6. Online:
    - http://medicinesaustralia.com.au/files/2012/05/MA_QUM_External_Reduced.pdf
    - http://curriculum.racgp.org.au/statements/quality-use-of-medicines/
    - http://www.rug.nl/research/portal/files/14051541/Chapter_2.pdf
    - Relevant review articles from recent medical and pharmaceutical literature.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year II Sem (PHARMACY PRACTICE)

PRINCIPLES OF DRUG DISCOVERY (Professional Elective- IV)

Course Objective: The subject imparts basic knowledge of drug discovery process. This information will make the student competent in drug discovery process

Course Outcome: Upon completion of the course, the student shall be able to,

- Explain the various stages of drug discovery.
- Appreciate the importance of the role of genomics, proteomics and bioinformatics in drug discovery
- Explain various targets for drug discovery.
- Explain various lead seeking method and lead optimization
- Appreciate the importance of the role of computer aided drug design in drug discovery

UNIT - I

An overview of modern drug discovery process: Target identification, target validation, lead identification and lead Optimization. Economics of drug discovery.

Target Discovery and validation-Role of Genomics, Proteomics and Bioinformatics. Role of Nucleic acid microarrays, Protein microarrays, Antisense technologies, siRNAs, antisense oligonucleotides, Zinc finger proteins. Role of transgenic animals in target validation.

UNIT - II

Lead Identification- combinatorial chemistry & high throughput screening, in silico lead discovery techniques, Assay development for hit identification.

Protein structure Levels of protein structure, Domains, motifs, and folds in protein structure. Computational prediction of protein structure: Threading and homology modeling methods. Application of NMR and X-ray crystallography in protein structure prediction

UNIT - III

Rational Drug Design Traditional vs rational drug design, Methods followed in traditional drug design, High throughput screening, Concepts of Rational Drug Design,

Rational Drug Design Methods: Structure and Pharmacophore based approaches

Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore-based Screening

UNIT - IV

Molecular docking: Rigid docking, flexible docking, manual docking; Docking based screening. De novo drug design.

Quantitative analysis of Structure Activity Relationship History and development of QSAR, SAR versus QSAR, Physicochemical parameters, Hansch analysis, Fee Wilson analysis and relationship between them.

UNIT - V

QSAR Statistical methods – regression analysis, partial least square analysis (PLS) and other multivariate statistical methods.

3D-QSAR approaches like COMFA and COMSIA

Prodrug design-Basic concept, Prodrugs to improve patient acceptability, Drug solubility, Drug absorption and distribution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design

REFERENCES:

1. Mouldy Sioud. Target Discovery and Validation Reviews and Protocols: Volume 2 Emerging Molecular Targets and Treatment Options. 2007 Humana Press Inc.
2. Darryl León. Scott MarkelIn. Silico Technologies in Drug Target Identification and Validation. 2006 by Taylor and Francis Group, LLC.
3. Johanna K. DiStefano. Disease Gene Identification. Methods and Protocols. Springer New York Dordrecht Heidelberg London.
4. Hugo Kubiny. QSAR: Hansch Analysis and Related Approaches. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
5. Klaus Gubernator, Hans-Joachim Böhm. Structure-Based Ligand Design. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
6. Abby L. Parrill. M. Rami Reddy. Rational Drug Design. Novel Methodology and Practical Applications. ACS Symposium Series; American Chemical Society: Washington, DC, 1999.
7. J. Rick Turner. New drug development design, methodology and, analysis. John Wiley & Sons, Inc., New Jersey.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Pharm I Year II Sem (PHARMACY PRACTICE)

CELLULAR AND MOLECULAR PHARMACOLOGY (Professional Elective - IV)

Course Objectives: The subject imparts a fundamental knowledge on the structure and functions of cellular components and help to understand the interaction of these components with drugs. This information will further help the student to apply the knowledge in drug discovery process.

Course Outcomes: Upon completion of the course, the student shall be able to, Explain the receptor signal transduction processes. Explain the molecular pathways affected by drugs. Appreciate the applicability of molecular pharmacology and biomarkers in drug discovery process. Demonstrate molecular biology techniques as applicable for pharmacology

UNIT - I
Cell biology Structure and functions of cell and its organelles Genome organization. Gene expression and its regulation, importance of siRNA and micro RNA, gene mapping and gene sequencing Cell cycles and its regulation. Cell death– events, regulators, intrinsic and extrinsic pathways of apoptosis. Necrosis and autophagy.

UNIT- II
Cell signaling Intercellular and intracellular signaling pathways. Classification of receptor family and molecular structure ligand gated ion channels; G-protein coupled receptors, tyrosine kinase receptors and nuclear receptors. Secondary messengers: cyclic AMP, cyclic GMP, calcium ion, inositol 1,4,5-trisphosphate, (IP3), NO, and diacylglycerol. Detailed study of following intracellular signaling pathways: cyclic AMP signaling pathway, mitogen-activated protein kinase (MAPK) signaling, Janus kinase (JAK)/signal transducer and activator of transcription (STAT) signaling pathway.

UNIT- III
Principles and applications of genomic and proteomic tools DNA electrophoresis, PCR (reverse transcription and real time), Gene sequencing, micro array technique, SDS page, ELISA and western blotting, Recombinant DNA technology and gene therapy Basic principles of recombinant DNA technology-Restriction enzymes, various types of vectors. Applications of recombinant DNA technology. Gene therapy- Various types of gene transfer techniques, clinical applications and recent advances in gene therapy.

UNIT- IV
Pharmacogenomics Gene mapping and cloning of disease gene. Genetic variation and its role in health/ pharmacology Polymorphisms affecting drug metabolism Genetic variation in drug transporters Genetic variation in G protein coupled receptors Applications of proteomics science: Genomics, proteomics, metabolomics, functionomics, nutrigenomics Immunotherapeutics Types of immunotherapeutics, humanisation antibody therapy, Immunotherapeutics in clinical practice

UNIT- V
Cell culture techniques Basic equipment used in cell culture lab. Cell culture media, various types of cell culture, general procedure for cell cultures; isolation of cells, subculture, cryopreservation, characterization of cells and their application. Principles and applications of cell viability assays, glucose uptake assay, Calcium influx assays Principles and applications of flow cytometry b. Biosimilars

REFERENCES:
1. The Cell, A Molecular Approach. Geoffrey M Cooper.

2. Pharmacogenomics: The Search for Individualized Therapies. Edited by J. Licinio and M -L. Wong
3. Handbook of Cell Signaling (Second Edition) Edited by Ralph A. et.al
4. Molecular Pharmacology: From DNA to Drug Discovery. John Dickenson et.al
5. Basic Cell Culture protocols by Cheril D. Helgason and Cindy L. Miller
6. Basic Cell Culture (Practical Approach) by J. M. Davis (Editor)
7. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
8. Current protocols in molecular biology vol I to VI edited by Frederick M. Ausuvel et la.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (PHARMACY PRACTICE)

NUTRACEUTICALS (Professional Elective - IV)

Course Objectives: The students will expose to characteristic features of various phytochemicals as nutraceuticals in various diseased conditions and also know the role of antioxidant in free radical induced disease conditions and will expose to various food laws and regulations.

Course Outcomes: Helps the student to understand the importance of Nutraceuticals in various common problems with the concept of free radicals

UNIT - I

a. Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer etc.

b. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods:

Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds

UNIT - II

Phytochemicals as nutraceuticals: Occurrence and characteristic features (chemical nature medicinal benefits) of following

a) Carotenoids- α and β-Carotene, Lycopene, Xanthophylls, lutein
b) Sulfides: Diallylsulfides, Allyltrisulfide.
c) Polyphenolics: Reservetrol
d) Flavonoids- Rutin , Naringin, Quercitin, Anthocyanidins, catechins, Flavones
e) Prebiotates / Probiotics.: Fructo oligosaccharides, Lactobacillum
f) Phytoestrogens: Isoflavones, daidzein, Geebustin, lignans
g) Tocopherols

UNIT - III

a. Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids.

b. Measurement of free radicals: Lipid peroxidation products, lipid hydroperoxide, malondialdehyde.

UNIT - IV

a. Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals involvement in other disorders. Free radicals theory of ageing.

b. Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E, α-Lipoic acid, melatonin

Synthetic antioxidants: Butylatedhydroxy Toluene, Butylatedhydroxy Anisole.

UNIT - V

Food Laws and Regulations; FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods.

Regulations and Claims – Current Products: Label Claims, Nutrient Content Claims, Health Claims, Dietary Supplements Claims

REFERENCES:

1. Dietetics by Sri Lakshmi
2. Role of dietary fibres and nutraceuticals in preventing diseases by K. T. Agusti and P. Faizal: BS Publication.
3. Advanced Nutritional Therapies by Cooper. K.A., (1996).
4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).
5. Prescription for Nutritional Healing by James F.Balch and Phyllis A. Balch 2nd Edn., Avery Publishing Group, NY (1997).
6. G. Gibson and C. Williams Editors *2000 Functional foods* Woodhead Publ. Co. London.
7. Goldberg, I. *Functional Foods*. 1994. Chapman and Hall, New York.
8. Labuza, T.P. 2000 Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in *Essentials of Functional Foods* M. K. Sachmidl and T.P. Labuza eds. Aspen Press.
9. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition)
10. Shils, ME, Olson, JA, Shike, M. 1994 *Modern Nutrition in Health and Disease*. Eighth edition. Lea and Febiger

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (PHARMACY PRACTICE)

PHARMACOTHERAPEUTICS - II LAB (Laboratory - III)

The students are required to be posted to various clinical wards for their exposure with therapeutic management and other clinical aspects. They are expected to have experience and do a tutorial as well as case presentation in the following clinical conditions. The students have to make at least 10 case presentations covering most common diseases found in the hospital to which the college is attached. The student should also submit a record of the cases presented. The list of clinical cases presented should include follow-up of the clinical cases mentioned below from the day of admission till discharge and presented in the SOAP (Subjective, Objective, Assessment and Plan) format.

I. The cases may be selected from the following diseases: 7. Neurology & Psychiatry 8. Oncology 9. Infectious Diseases & Immunology 10. Dermatology
II. Rational use of medicines in special population admitted in above wards (three)
III. Calculation of Bioavailability and Bioequivalence from the given data (two)
IV. Interpretation of Therapeutic Drug Monitoring reports of a given patient of any of the above wards (three)
V. Calculation of various Pharmacoeconomic outcome analysis for the given data from the above (two)

ASSIGNMENTS: The students are required to submit a minimum of three written assignments (1500 to 2000 words) selected from the topics on different disease conditions given to them. The students are required to discuss both the clinical and therapeutic aspects in the same.

REFERENCES:

1. Roger and Walker. Clinical Pharmacy and Therapeutics – Churchill Livingstone publication.
2. Joseph T. Dipiro et al. Pharmacotherapy: A Pathophysiologic Approach-Appleton & Lange
3. Robins SL. Pathologic basis of disease -W. B. Saunders publication
4. Eric T. Herfindal. Clinical Pharmacy and Therapeutics- Williams and Wilkins Publication
5. Lloyd Young and Koda-Kimble MA Applied Therapeutics: The clinical Use of Drugs- Lippincott Williams and Wilkins
6. Chisholm - Burns Wells Schwinghammer Malone and Joseph P Dipiro. Pharmacotherapy Principles and practice-– McGraw Hill Publication

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm I Year II Sem (PHARMACY PRACTICE)

CLINICAL PHARMACOKINETICS AND THERAPEUTIC DRUG MONITORING LAB
(Laboratory - IV)

List of Experiments:

1. Causality assessment of adverse drug reactions (three)
2. Detection and management of medication errors (three)
3. Manufacture of parenteral formulations, powders.
4. Drug information queries.
5. Inventory control
6. Study of Design and Management of Hospital pharmacy department of a hospital.
7. Composition of Pharmacy and Therapeutics committee – Organization, functions, and limitations.
8. Development of a hospital formulary for a teaching hospital
9. Various sources of drug information and systematic approach to provide unbiased drug information.
10. Evaluation of prescriptions generated in hospital for drug interactions and find out the suitable management

REFERENCES:

1. Leon Shargel, Susanna Wu-Pong, Andrew Yu. Applied Biopharmaceutics & Pharmacokinetics. New York: McGraw Hill.
2. Peter L. Bonate. Pharmacokinetic - Pharmacodynamic Modeling and Simulation. Springer Publications.
3. Michael E. Burton, Leslie M. Shaw, Jerome J. Schentag, William E. Evans. Applied Pharmacokinetics & Pharmacodynamics: Principles of Therapeutic Drug Monitoring. lippincott Williams & Wilkins.
4. Steven How-Yan Wong, Irving Sunshine. Handbook of AnalyticalTherapeutic Drug Monitoring and Toxicology. CRC Press, USA.
5. Soraya Dhillon, Andrzej Kostrzewski. Clinical pharmacokinetics. 1st edition. London: Pharmaceutical Press.
6. Joseph T. Dipiro, William J. Spruill, William E. Wade, Robert A.Blouin and Jane M. Pruemer Concepts in Clinical Pharmacokinetics. AmericanSociety of Health-System Pharmacists, USA.
7. Malcolm Rowland, Thomas N. Tozer. Clinical Pharmacokinetics and pharmacodynamics: concepts and applications. lippincott Williams & Wilkins, USA.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm II Year I Sem (PHARMACY PRACTICE)

BIOSTATISTICS (Professional Elective - V)

Course Objectives: The student shall know the introduction, scope of biostatistics and Research work, calculation and present of the data.

Course Outcomes: The student will be known the Biostatistics arrangement, presentation and formation of tables and charts. They also know the correlation and regression & application of different methods, analysis of data.

UNIT - I
Introduction and scope of biostatistics: Use of statistics in Pharmacy. Population and Sample collection. Stages of research, types of data and methods of data collections. Data arrangement and presentation, formation of table and charts.

UNIT - II
Measures of central tendency: computation of means, median and mode from grouped and ungrouped data.
Measure of dispersion: computation of variance, standard deviation, standard error and their coefficients.

UNIT - III
Measures of Correlation and Regression
Probability rules: Binomial, Poison and Normal distribution.

UNIT - IV
Experimental designing, planning of an experiment, replication and randomization.
Analysis of Variance (ANOVA): 1-way, 2- Way

UNIT - V
Hypothesis testing: Student 't' test, Chi square test,
Non- Parametric Tests: Sign Test, Sign Rank Test, Wilcoxon Sign Rank Test

REFERENCE BOOKS:

1. Statistics for business and economics 3rd edition by Vikas books publications
2. Biostatistics & Computer applications by GN Rao and NK Tiwari
3. Sokal, R.R. and Rohlf, F.J. 1987. An Introduction to Biostatistics. W.H. Freeman and Company.
4. Bailey, N.T.J. 1981. Statistical Methods in Biology. English University Press.
5. Mitchell, K. and Glover, T. 2001. Introduction to Biostatistics. McGraw Hill, Publishing Co.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm II Year I Sem (PHARMACY PRACTICE)

PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS (Professional Elective - V)

Course Objective: This course enables students to understand various pharmacoepidemiological methods and their clinical applications. Also, it aims to impart knowledge on basic concepts, assumptions, terminology, and methods associated with Pharmacoeconomics and health related outcomes, and when should be appropriate Pharmacoeconomic model should be applied for a health care regimen.

Course Outcome: Upon completion of this course it is expected that students shall be able to:

- Understand the various epidemiological methods and their applications
- Understand the fundamental principles of Pharmacoeconomics.
- Identify and determine relevant cost and consequences associated with pharmacy products and services.
- Perform the key Pharmacoeconomics analysis methods
- Understand the Pharmacoeconomic decision analysis methods and its applications.
- Describe current Pharmacoeconomic methods and issues.
- Understand the applications of Pharmacoeconomics to various pharmacy settings.

UNIT - I

Introduction to Pharmacoepidemiology: Definition, Scope, Need, Aims & Applications; Outcome measurement: Outcome measures, Drug use measures: Monetary units, Number of prescriptions, units of drug dispensed, defined daily doses, prescribed daily doses, Diagnosis and Therapy surveys, Prevalence, Incidence rate, Monetary units, number of prescriptions, unit of drugs dispensed, defined daily doses and prescribed daily doses, medications adherence measurements. Concept of risk: Measurement of risk, Attributable risk and relative risk, Time- risk relationship and odds ratio

UNIT - II

Pharmacoepidemiological Methods: Qualitative models: Drug Utilization Review; Quantitative models: case reports, case series, Cross sectional studies, Cohort and case control studies, Calculation of Odds' ratio, Meta-analysis models, Drug effects study in populations: Spontaneous reporting, Prescription event monitoring, Post marketing surveillance, Record linkage systems, Applications of Pharmacoepidemiology

UNIT - III

Introduction to Pharmacoeconomics: Definition, history of Pharmacoeconomics, Need of Pharmacoeconomic studies in Indian healthcare system. Cost categorization and resources for cost estimation: Direct costs. Indirect costs. Intangible costs. Outcomes and Measurements of Pharmacoeconomics: Types of outcomes: Clinical outcome, Economic outcomes, Humanistic outcomes; Quality Adjusted Life Years, Disability Adjusted Life Years Incremental Cost-Effective Ratio, Average Cost-Effective Ratio. Person Time, Willingness to Pay, Time Trade Off and Discounting.

UNIT - IV

Pharmacoeconomic evaluations: Definition, Steps involved, Applications, Advantages and disadvantages of the following Pharmacoeconomic models: Cost Minimization Analysis (CMA),Cost Benefit Analysis (CBA), Cost Effective Analysis (CEA), Cost Utility Analysis (CUA), Cost of Illness (COI), Cost Consequences Analysis (COA).

UNIT - V

Definition, Steps involved, Applications, Advantages and disadvantages of the following:

Health related quality of life (HRQOL): Definition, Need for measurement of HRQOL, Common HRQOL measures. Definition, Steps involved, Applications of the following: Decision Analysis and Decision tree, Sensitivity analysis, Markov Modeling, Software used in Pharmacoeconomic analysis, Applications of Pharmacoeconomics.

REFERENCES:

1. Rascati K L. Essentials of Pharmacoeconomics, Woulters Kluwe rLippincott Williams & Wilkins, Philadelphia.
2. Thomas E Getzen. Health economics. Fundamentals and Flow of Funds. John Wiley & Sons, USA.
3. Andrew Briggs, Karl Claxton, Mark Sculpher. Decision Modeling for Health Economic Evaluation, Oxford University Press, London.
4. K G Revikumar, Pharmacoepidemiology and Pharmacoeconomics Concepts and Practices.
5. Michael Drummond, Mark Sculpher, George Torrence, Bernie O'Brien and Greg Stoddart. Methods for the Economic Evaluation of Health Care Programs Oxford University Press, London.
6. George E Mackinnon III. Understanding health outcomes and Pharmacoeconomics.
7. Graker, Dennis. Pharmacoeconomics and outcomes.
8. Walley, Pharmacoeconomics.
9. Pharmacoeconomic – ed. by Nowakowska – University of Medical Sciences, Poznan.
10. Relevant review articles from recent medical and pharmaceutical literature
11. Guru Prasad Mohanta and P K Manna, Textbook of Pharmacovigilance Concepts and Practice

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm II Year I Sem (PHARMACY PRACTICE)

PHYTOPHARMACEUTICALS (Professional Elective - V)

Course Objective: This subject will provide the knowledge about the sourse, phytochemistry, physiological activities of anticancer, CVS &Nervous systems and anti-inflammatory drugs from natural sources. This also gives information about isolation and characterization of phytoconstituents.

Course Outcome: Upon completion of the course, the student shall be able to,
- Explain the sourses of phytoconstituents
- able to know activities of different kind
- able to isolate and characterization constituents.
- Detect chemical nature by different spectra's.

Source, phytochemistry (isolation, identification, chemical nature), and physiological activities of following phytopharmaceuticals.

UNIT - I
1) Anticancer: Taxol, other taxanes, Camptothecin, vinblastine, Genistein, Etoposide

UNIT - II
2) Nervous system activities: Hypericin, Valepotriates, Gingkolides
3) CVS activities: Colenol, Streptokinase

UNIT - III
4) Anti-inflammatory: Curcuminoids, Guggulipids, Boswellic acid, Serratiopeptidase.

UNIT - IV
5) Miscellaneous: Silymarin, Artemisinin, Omega-3 fatty acids. Charantin and momordicosides, Resveretrol, Protamine sulphate, prostaglandins.

UNIT - V
Occurrence, isolation and characteristic features (Chemical nature, uses in pharmacy, medicinal and health benefits) of following.
a) Carotenoids – i) α and β - Carotene ii) Xanthophyll (Lutein)
b) Limonoids – i) d-Limonene ii) α – Terpineol
c) Saponins – i) Shatavarins
d) Flavonoids – i) Resveratrol ii) Rutin iii) Hesperidin iv) Naringin v) Quercetin
e) Phenolic acids- Ellagic acid
f) Tocotrienols and Tocopherols

RECOMMENDED BOOKS:
1. Pharmacognosy: Trease and Evans, Bailliere & Tindall, 14th edth.
2. Pharmacognosy: Kokate, Purohit, Gokhale, Nirali Prakashan, Pune, 15th edtn.
3. Biochemistry: Delvin
4. Alkaloids Edited by J.R.F. Manske
5. Various Research Journals on Natural products and therapeutics.

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M.Pharm (PHARMACY PRACTICE)

ENGLISH FOR RESEARCH PAPER WRITING (Audit Course - I & II)

Prerequisite: None

Course objectives: Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

UNIT-I:
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-II:
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-III:
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV:
key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT-V:
skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

TEXT BOOKS/ REFERENCES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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M.Pharm (PHARMACY PRACTICE)

DISASTER MANAGEMENT (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches,
- planning and programming in different countries, particularly their home country or the countries they work in

UNIT-I:

Introduction:

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India:

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-II:

Repercussions of Disasters and Hazards:

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III:

Disaster Preparedness and Management:

Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-IV:

Risk Assessment Disaster Risk:

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT-V:

Disaster Mitigation:

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

TEXT BOOKS/ REFERENCES:

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “’New Royal book Company.
2. Sahni, Pardeep Et. Al. (Eds.),” Disaster Mitigation Experiences and Reflections”, Prentice Hall of India, New Delhi.
3. Goel S. L., Disaster Administration and Management Text and Case Studies”, Deep &Deep Publication Pvt. Ltd., New Delhi.

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M.Pharm (PHARMACY PRACTICE)

SANSKRIT FOR TECHNICAL KNOWLEDGE (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Course Outcomes: Students will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

UNIT-I:
Alphabets in Sanskrit,

UNIT-II:
Past/Present/Future Tense, Simple Sentences

UNIT-III:
Order, Introduction of roots,

UNIT-IV:
Technical information about Sanskrit Literature

UNIT-V:
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TEXT BOOKS/ REFERENCES:

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (PHARMACY PRACTICE)

VALUE EDUCATION (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

Course outcomes: Students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality

UNIT-I:
Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

UNIT-II:
Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

UNIT-III:
Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

UNIT-IV:
Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT-V:
Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation, Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

TEXT BOOKS/ REFERENCES:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

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M.Pharm (PHARMACY PRACTICE)

CONSTITUTION OF INDIA (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

UNIT-I:
History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working), **Philosophy of the Indian Constitution:** Preamble**,** Salient Features.

UNIT-II:
Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality**,** Right to Freedom**,** Right against Exploitation**,** Right to Freedom of Religion**,** Cultural and Educational Rights**,** Right to Constitutional Remedies, Directive Principles of State Policy**,** Fundamental Duties.

UNIT-III:
Organs of Governance: Parliament**,** Composition**,** Qualifications and Disqualifications**,** Powers and Functions**,** Executive**,** President**,** Governor**,** Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

UNIT-IV:
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT-V:
Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

TEXT BOOKS/ REFERENCES:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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M.Pharm (PHARMACY PRACTICE)

PEDAGOGY STUDIES (Audit Course - I & II)

Prerequisite: None

Course Objectives: Students will be able to:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Course Outcomes: Students will be able to understand:

- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

UNIT-I:

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

UNIT-II:

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT-III:

Evidence on the effectiveness of pedagogical practices, Methodology for the indepth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the scho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT-IV:

Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT-V:

Research gaps and future directions: Research design**,** Contexts**,** Pedagogy**,** Teacher education**,** Curriculum and assessment**,** Dissemination and research impact.

TEXT BOOKS/ REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.

3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Pharm (PHARMACY PRACTICE)

STRESS MANAGEMENT BY YOGA (Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To achieve overall health of body and mind
- To overcome stress

Course Outcomes: Students will be able to:

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

UNIT-I:
Definitions of Eight parts of yog. (Ashtanga)

UNIT-II:
Yam and Niyam.

UNIT-III:
Do`s and Don't's in life.
i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT-IV:
Asan and Pranayam

UNIT-V:
i) Various yog poses and their benefits for mind & body
ii) Regularization of breathing techniques and its effects-Types of pranayam

TEXT BOOKS/ REFERENCES:

1. 'Yogic Asanas for Group Tarining-Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

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M.Pharm (PHARMACY PRACTICE)

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS
(Audit Course - I & II)

Prerequisite: None

Course Objectives:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Course Outcomes: Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

UNIT-I:

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

UNIT-II:

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-III:

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT-IV:

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

UNIT-V:

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

TEXT BOOKS/ REFERENCES:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
(Established by Act No.30 of 2008)
Kukatpally, Hyderabad–500085, Telangana State (India)

Academic Regulations of M.Pharm. (Regular/Full Time) Programmes, 2019-20 (R19)
(CBCS)
(Effective for the students admitted into I year from the Academic Year 2019-20 and onwards)

1.0 **Post-Graduate Degree Programmes in Pharmacy (PGP in Pharmacy)** Jawaharlal Nehru Technological University Hyderabad (JNTUH) offers **Two** Years (**Four** Semesters) full-time Master of Pharmacy (M.Pharm.) Degree programmes, under Choice Based Credit System (CBCS) at its constituent (non-autonomous) and affiliated colleges in different specializations.

2.0 **Eligibility for Admissions**

2.1 Admission to the PGPs shall be made subject to eligibility, qualification and specializations prescribed by the University from time to time, for each specialization under each M.Pharm. programme.

2.2 Admission to the post graduate programme shall be made on the basis of either the merit rank or Percentile obtained by the qualified student in the relevant qualifying GPAT Examination/ the merit rank obtained by the qualified student in an entrance test conducted by Telangana State Government (PGECET) for M.Pharm. programmes / an entrance test conducted by JNTUH/ on the basis of any other exams approved by the University, subject to reservations as laid down by the Govt. from time to time.

2.3 The medium of instructions for all PG Programmes will be **ENGLISH** only.

3.0 **M.Pharm. Programme (PGP in Pharmacy) Structure**

3.1 The M.Pharm. Programmes in Pharmacy of JNTUH are of Semester pattern, with **Four** Semesters consisting of **Two** academic years, each academic year having **Two** Semesters (First/Odd and Second/Even Semesters). Each Semester shall be of 22 weeks duration (inclusive of Examinations), with a minimum of 90 instructional days per Semester.

3.2 The student shall not take more than four academic years to fulfill all the academic requirements for the award of M.Pharm. degree from the date of commencement of first year first semester, failing which the student shall forfeit the seat in M.Pharm. programme.

3.3 **UGC/AICTE** specified definitions/descriptions are adopted appropriately for various terms and abbreviations used in these PG academic regulations, as listed below:

3.3.1 **Semester Scheme**

Each Semester shall have 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) are taken as 'references' for the present set of Regulations. The terms 'SUBJECT' and 'COURSE' imply the same meaning here and refer to 'Theory Subject', or 'Lab Course', or 'Design/Drawing Subject', or 'Mini Project with Seminar', or 'Dissertation', as the case may be.

3.3.2 **Credit Courses**

All subjects/courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/course in an L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods: Credits) structure based on the following general pattern:

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- One credit for one hour/week/semester for theory/lecture (L) courses
- One credit for two hours/ week/semester for laboratory/ practical (P) courses or tutorials (T)

Other student activities like study tour, guest lecture, conference/workshop participations, technical paper presentations and mandatory courses (***Audit Courses***) will not carry any credits.

3.3.3 Subject Course Classification

All subjects/courses offered for the Post-Graduate Programme in Pharmacy (M.Pharm. Degree Programme) are broadly classified as follows. The University has followed in general the guidelines issued by AICTE/UGC.

S.No.	Broad Course Classification	Course Group/ Category	Course Description
1	Core Courses (CoC)	PC- Professional Core	Includes subjects related to the Specialization in Pharmacy
		Dissertation	M.Pharm. Project or PG Project or Major Project
		Mini Project with Seminar	Seminar based on core contents related to the Specialization in Pharmacy
2	Elective Courses (EıE)	PE - Professional Electives	Includes elective subjects related to the Specialization in Pharmacy
		OE - Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Specialization in Pharmacy
3	***Mandatory Courses***	--	***Non-Credit Audit Courses***

4.0 Course Registration

4.1 A 'Faculty Advisor or Counselor' shall be assigned to each specialization, who will advise on the Post Graduate Programme (PGP), its Course Structure and Curriculum, Choice/Option for Subjects/ Courses, based on his competence, progress, pre-requisites and interest.

4.2 The Academic Section of the College invites 'Registration Forms' from students within 15 days from the commencement of class work through 'ON-LINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ON-LINE Registration Requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

4.3 A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his Faculty Advisor, which should be submitted to the College Academic Section through the Head of Department (a copy of it being retained with Head of Department, Faculty Advisor and the Student).

4.4 If the Student submits ambiguous choices or multiple options or erroneous entries during ON-LINE Registration for the Subject(s) / Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, only the first mentioned Subject/ Course in that Category will be taken into consideration.

4.5 Subject/ Course Options exercised through ON-LINE Registration are final and CANNOT be changed, nor can they be inter-changed; further, alternate choices also will not be considered. However, if the Subject/ Course that has already been listed for Registration by the University in a Semester could not be offered due to unforeseen or unexpected reasons, then the Student will be allowed to have alternate

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choice either for a new Subject, if it is offered, or for another existing Subject (subject to availability of seats). Such alternate arrangements will be made by the Head of Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

5.0 Attendance Requirements

The programmes are offered based on a unit system with each subject being considered a unit. Attendance is calculated separately for each subject.

5.1 Attendance in all classes (Lectures/Laboratories) is compulsory. The minimum required attendance in each theory subject (***also mandatory(audit) courses***) including the attendance of mid-term examination / Laboratory etc. is 75%. Two periods of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject. ***This attendance should also be included in the fortnightly upload of attendance to the University. The attendance of mandatory(audit) courses should be uploaded separately to the University.*** A student shall not be permitted to appear for the Semester End Examinations (SEE), if his attendance is less than 75%.

5.2 A student's Seminar report and presentation on Mini Project shall be eligible for evaluation, only if he ensures a minimum of 75% of his attendance in Seminar presentation classes on Mini Project during that Semester.

5.3 **Condoning of shortage of attendance** (between 65% and 75%) up to a maximum of 10% (considering the days of attendance in sports, games, NCC, NSS activities and Medical grounds) in each subject (Theory/Lab/Mini Project with Seminar) of a semester shall be granted by the College Academic Committee on genuine reasons.

5.4 A prescribed fee per subject shall be payable for condoning shortage of attendance after getting the approval of College Academic Committee for the same. The College Academic Committee shall maintain relevant documents along with the request from the student.

5.5 Shortage of Attendance below 65% in any subject shall in **no case be condoned.**

5.6 A Student, whose shortage of attendance is not condoned in any Subject(s) (Theory/Lab/Mini Project with Seminar) in any Semester, is considered as 'Detained in that Subject(s), and is not eligible to write Semester End Examination(s) of such Subject(s), (in case of Mini Project with Seminar, his/her Mini Project with Seminar Report or Presentation are not eligible for evaluation) in that Semester; and he/she has to seek re-registration for those Subject(s) in subsequent Semesters, and attend the same as and when offered.

5.7 A student fulfills the attendance requirement in the present semester, shall not be eligible for readmission into the same class.

5.8 **a)** A student shall put in a minimum required attendance in at least **three theory subjects (excluding *mandatory(audit)* course)** in first Year I semester for promotion to first Year II Semester.

b) A student shall put in a minimum required attendance in at least **three theory subjects (excluding *mandatory(audit)* course)** in first Year II semester for promotion to second Year I Semester.

6.0 Academic Requirements

The following academic requirements must be satisfied, in addition to the attendance requirements mentioned in item no. 5. The performance of the candidate in each semester shall be evaluated subject-

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wise, with a maximum of 100 marks per subject / course (theory / practical), based on Internal Evaluation and Semester End Examination.

6.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course, if he secures not less than 40% of marks (30 out of 75 marks) in the End Semester Examination, and a minimum of 50% of marks in the sum total of CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades and this implies securing 'B' Grade or above in a subject.

6.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Mini Project with seminar, if student secures not less than 50% marks (i.e. 50 out of 100 allotted marks). The student would be treated as failed, if student (i) does not submit a seminar report on Mini Project or does not make a presentation of the same before the evaluation committee as per schedule or (ii) secures less than 50% marks in Mini Project with seminar evaluation. The failed student shall reappear for the above evaluation when the notification for supplementary examination is issued.

6.3 A student shall register for all subjects for total of **68** credits as specified and listed in the course structure for the chosen specialization, put in required the attendance and fulfill the academic requirements for securing **68** credits obtaining a minimum of 'B' Grade or above in each subject, and all **68** credits securing Semester Grade Point Average **(SGPA) ≥6.0** (in each semester) and final Cumulative Grade Point Average **(CGPA)** (i.e., CGPA at the end of PGP**) ≥ 6.0**, and shall ***pass all the mandatory(audit) courses*** to complete the PGP successfully.

Note: (1) The SGPA will be computed and printed on the marks memo only if the candidate passes in all the subjects offered and gets minimum B grade in all the subjects.

(2) CGPA is calculated only when the candidate passes in all the subjects offered in all the semesters

6.4 Marks and Letter Grades obtained in all those subjects covering the above specified **68** credits alone shall be considered for the calculation of final CGPA, which will be indicated in the Grade Card /Marks Memo of second year second semester.

6.5 If a student registers for extra subject(s) (in the parent specialization or other specializations of Pharmacy) other than those listed subjects totaling to **68** credits as specified in the course structure, the performance in extra subject(s) (although evaluated and graded using the same procedure as that of the required **68** credits) will not be considered while calculating the SGPA and CGPA. For such extra subject(s) registered, percentage of marks and Letter Grade alone will be indicated in the Grade Card/Marks Memo, as a performance measure, subject to completion of the attendance and academic requirements as stated in items 5 and 6.1 - 6.3.

6.6 When a student is detained due to shortage of attendance in any subject(s) in any semester, no Grade allotment will be made for such subject(s). However, he is eligible for re-registration of such subject(s) in the subsequent semester(s), as and when next offered, with the academic regulations of the batch into which he is re-registered, by paying the prescribed fees per subject. In all these re-registration cases, the student shall have to secure a fresh set of internal marks and Semester End Examination marks for performance evaluation in such subject(s), and SGPA/CGPA calculations.

6.7 A student eligible to appear for the Semester End Examination in any subject, but absent from it or failed (failing to secure 'B' Grade or above), may reappear for that subject at the supplementary examination as and when conducted. In such cases, his Internal Marks assessed earlier for that subject will be carried over, and added to the marks secured in the supplementary examination, for

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the purpose of evaluating his performance in that subject.

6. 8 A Student who fails to earn **68** credits as per the specified course structure, and as indicated above, within **four** academic years from the date of commencement of his first year first semester, shall forfeit his seat in M.Pharm. programme and his admission **shall stand cancelled.**

7.0 Evaluation - Distribution and Weightage of Marks

The performance of a student in each semester shall be evaluated subject- wise (irrespective of credits assigned) for a maximum of 100 marks.

7.1 For the theory subjects 75 marks shall be awarded for the performance in the Semester End Examination and 25 marks shall be awarded for Continuous Internal Evaluation (CIE). The Continuous Internal Evaluation shall be made based on the average of the marks secured in the two Mid-Term Examinations conducted, first Mid-Term examinations in the middle of the Semester and second Mid-Term examinations during the last week of instruction. Each Mid-Term Examination shall be conducted for a total duration of 120 minutes with Part 'A' as compulsory consisting of 5 questions carrying 2 marks each (10 marks), and Part 'B' with 3 questions to be answered out of 5 questions, each question carrying 5 marks (15 marks). The details of the Question Paper pattern for Semester End Examination (Theory) are given below:

- The Semester End Examination will be conducted for 75 marks. It consists of two parts.

  i) Part A for 25 marks, ii) Part B for 50 marks.
- Part A is compulsory and consists of 5 questions, one from each unit and carrying 5 marks each.
- Part B consists of 5 questions carrying 10 marks each. There will be two questions from each unit and only one should be answered.

7.2 For practical subjects, 75 marks shall be awarded for performance in the Semester End Examinations and 25 marks shall be awarded for day-to-day performance as Internal Marks.

7.3 For conducting laboratory end examinations of all PG Programmes, one internal examiner and one external examiner are to be appointed by the Principal of the College and this is to be informed to the Director of Evaluation within two weeks, before commencement of the lab end examinations. The external examiner should be selected from outside the College concerned but within the cluster. No external examiner should be appointed from any other College in the same cluster/any other cluster which is run by the same Management.

7.4 There shall be Mini Project with Seminar during I year II semester for internal evaluation of 100 marks. The Departmental Academic Committee (DAC) will review the progress of the mini project during the seminar presentations and evaluate the same for 50 marks. Mini Project Viva Voce will be evaluated by the DAC for another 50 marks before the semester end examinations. Student shall carryout the mini project in consultation with the mini project supervisor which may include critically reviewing the literature, project implementation and submit it to the department in the form of a report and shall make an oral presentation before the DAC consisting of Head of the Department, Mini Project supervisor and two other senior faculty members of the department. The student has to secure a minimum of 50% of marks in i) seminar presentation and ii) mini project viva voce, to be declared successful. If he fails to obtain the minimum marks, he has to reappear for the same as and when scheduled.

7.5 Every candidate shall be required to submit a dissertation on a topic approved by the Dissertation Review Committee.

7.6 A Dissertation Review Committee (DRC) shall be constituted with the Head of the Department as

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Chairperson, Dissertation Supervisor and one senior faculty member of the Department offering the M.Pharm. programme.

7.7 Registration of Dissertation Work: A candidate is permitted to register for the Dissertation Work after satisfying the attendance requirement in all the subjects, both theory and laboratory.

7.8 After satisfying 7.7, a candidate must present in Dissertation Work Review - I, in consultation with his Dissertation Supervisor, the title, objective and plan of action of his Dissertation work to the Dissertation Review Committee (DRC) for approval within four weeks from the commencement of Second year First Semester. Only after obtaining the approval of the DRC can the student initiate the Dissertation work.

7.9 If a candidate wishes to change his supervisor or topic of the Dissertation, he can do so with the approval of the DRC. However, the DRC shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of Dissertation proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

7.10 A candidate shall submit his Dissertation progress report in two stages at least with a gap of **three** months between them.

7.11 The work on the Dissertation shall be initiated at the beginning of the II year and the duration of the Dissertation is two semesters. A candidate is permitted to submit Dissertation Thesis only after successful completion of all theory and practical courses with the approval of DRC not earlier than 40 weeks from the date of approval of the Dissertation work. For the approval of DRC the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the DRC.

7.12 The Dissertation Work Review - II in II Year I Sem. carries internal marks of 100. Evaluation should be done by the DRC for 50 marks and the Supervisor will evaluate the work for the other 50 marks. The Supervisor and DRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain and progress of the Dissertation Work. A candidate has to secure a minimum of 50% of marks to be declared successful in Dissertation Work Review - II. If he fails to obtain the minimum required marks, he has to reappear for Dissertation Work Review - II as and when conducted.

7.13 The Dissertation Work Review - III in II Year II Sem. carries 100 internal marks. Evaluation should be done by the DRC for 50 marks and the Supervisor will evaluate it for the other 50 marks. The DRC will examine the overall progress of the Dissertation Work and decide whether or not the Dissertation is eligible for final submission. A candidate has to secure a minimum of 50% of marks to be declared successful in Dissertation Work Review - III. If he fails to obtain the required minimum marks, he has to reappear for Dissertation Work Review - III as and when conducted. For Dissertation Evaluation (Viva Voce) in II Year II Sem. there are external marks of 100 and it is evaluated by the external examiner. The candidate has to secure a minimum of 50% marks in Dissertation Evaluation (Viva-Voce) examination.

7.14 Dissertation Work Reviews - II and III shall be conducted in phase I (Regular) and Phase II (Supplementary). Phase II will be conducted only for unsuccessful students in Phase I. The unsuccessful students in Dissertation Work Review - II (Phase II) shall reappear for it at the time of Dissertation Work Review - III (Phase I). These students shall reappear for Dissertation Work Review - III in the next academic year at the time of Dissertation Work Review - II only after completion of Dissertation Work Review - II, and then Dissertation Work Review - III follows. The unsuccessful students in Dissertation Work Review - III (Phase II) shall reappear for Dissertation Work Review - III in the next academic year only at the time of Dissertation Work Review - II (Phase I).

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7.15 After approval from the DRC, a soft copy of the thesis should be submitted for ANTI-PLAGIARISM check and the plagiarism report should be submitted to the University and be included in the final thesis. The Thesis will be accepted for submission, if the similarity index is less than **30%**. If the similarity index has more than the required percentage, the student is advised to modify accordingly and re-submit the soft copy of the thesis after one month. The maximum number of re-submissions of thesis after plagiarism check is limited to TWO. The candidate has to register for the Dissertation work and work for two semesters. After three attempts, the admission is liable to be cancelled. The college authorities are advised to make plagiarism check of every soft copy of theses before submissions.

7.16 Three copies of the Dissertation Thesis certified by the supervisor shall be submitted to the College/School/Institute, after submission of a research paper related to the Dissertation work in a UGC approved journal. A copy of the submitted research paper shall be attached to thesis.

7.17 The thesis shall be adjudicated by an external examiner selected by the University. For this, the Principal of the College/School/Institute shall submit a panel of **three** examiners from among the list of experts in the relevant specialization as submitted by the supervisor concerned and Head of the Department.

7.18 If the report of the external examiner is unsatisfactory, the candidate shall revise and resubmit the Thesis. If the report of the examiner is unsatisfactory again, the thesis shall be summarily rejected. Subsequent actions for such dissertations may be considered, only on the specific recommendations of the external examiner and /or Dissertation Review Committee. No further correspondence in this matter will be entertained, if there is no specific recommendation for resubmission.

7.19 If the report of the examiner is satisfactory, the Head of the Department shall coordinate and make arrangements for the conduct of Dissertation Viva-Voce examination. The Dissertation Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who adjudicated the Thesis. The candidate has to secure a minimum of 50% of marks in Dissertation Evaluation (Viva-Voce) examination.

7.20 If he fails to fulfill the requirements as specified in 7.19, he will reappear for the Dissertation Viva-Voce examination only after three months. In the reappeared examination also, if he fails to fulfill the requirements, he will not be eligible for the award of the degree, unless he is asked to revise and resubmit his Dissertation Work by the board within a specified time period (within **four** years from the date of commencement of his first year first semester).

7.21 The Dissertation Viva-Voce External examination marks must be submitted to the University on the day of the examination.

7.22 For mandatory(audit) courses, a student has to secure 40 marks out of 100 marks (i.e. 40% of the marks allotted) in the continuous internal evaluation for passing the subject/course. These marks should also be uploaded along with the internal marks of other subjects.

7.23 No marks or letter grades shall be allotted for mandatory(audit) courses. Only Pass/Fail shall be indicated in Grade Card.

8.0 Re-Admission/Re-Registration

8.1 Re-Admission for Discontinued Student

A student, who has discontinued the M.Pharm. degree programme due to any reason whatsoever, may be considered for **'readmission'** into the same degree programme (with the same specialization) with the academic regulations of the batch into which he gets readmitted, with prior permission from the authorities concerned, subject to item 6.6.

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8.2 If a student is detained in a subject (s) due to shortage of attendance in any semester, he may be permitted to **re-register** for the same subject(s) in the same category (core or elective group) or equivalent subject, if the same subject is not available, as suggested by the Board of Studies of that department, as and when offered in the subsequent semester(s), with the academic regulations of the batch into which he seeks re-registration, with prior permission from the authorities concerned, subject to item 3.2

8.3 A candidate shall be given one chance to re-register and attend the classes for a maximum of two subjects, if the internal marks secured by a candidate are less than 50% and failed in those subjects but fulfilled the attendance requirement. A candidate must re-register for failed subjects within four weeks of commencement of the class work and secure the required minimum attendance. In the event of the student taking this chance, his Continuous Internal Evaluation (internal) marks and Semester End Examination marks obtained in the previous attempt stand cancelled.

9.0 Examinations and Assessment - The Grading System

9.1 Grades will be awarded to indicate the performance of each student in each Theory Subject, or Lab/Practicals, or Mini Project with Seminar, Dissertation, etc., based on the percentage of marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 7 above, and a corresponding Letter Grade shall be given.

9.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
90% and above (≥ 90%, ≤ 100%)	O (Outstanding)	10
Below 90% but not less than 80% (≥80%, <90%)	A^+ (Excellent)	9
Below 80% but not less than 70% (≥70%, <80%)	A (Very Good)	8
Below 70% but not less than 60% (≥60%, <70%)	B^+ (Good)	7
Below 60% but not less than 50% (≥ 50%, <60%)	B (above Average)	6
Below 50% (< 50%)	F (FAIL)	0
Absent	**Ab**	**0**

9.3 A student obtaining F Grade in any Subject is deemed to have 'failed' and is required to reappear as 'Supplementary Candidate' for the Semester End Examination (SEE), as and when conducted. In such cases, his Internal Marks (CIE Marks) in those subjects will remain as obtained earlier.

9.4 If a student has not appeared for the examinations, 'Ab' Grade will be allocated to him for any subject and shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' for the Semester End Examination (SEE), as and when conducted.

9.5 A Letter Grade does not imply any specific marks percentage; it is only the range of percentage of marks.

9.6 In general, a student shall not be permitted to repeat any Subject/ Course (s) only for the sake of 'Grade Improvement' or 'SGPA/ CGPA Improvement'.

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9.7 A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course. The corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ Course.

Credit Points (CP) = Grade Point (GP) x Credits …. For a Course

9.8 The student passes the Subject/ Course only when he **gets GP ≥6 (B Grade or above).**

9.9 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL Subjects/ Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

$$\text{SGPA} = \left\{ \sum_{i=1}^{N} C_i G_i \right\} / \left\{ \sum_{i=1}^{N} C_i \right\} \text{ …. For each Semester,}$$

where 'i' is the Subject indicator index (taking into account all Subjects in a Semester), 'N' is the no. of Subjects 'REGISTERED' for the Semester (as specifically required and listed under the Course Structure of the parent Department), C_i is the no. of Credits allotted to the i^{th} Subject, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that i^{th} Subject.

9.10 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all Semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the I Year Second Semester onwards, at the end of each Semester, as per the formula

$$\text{CGPA} = \left\{ \sum_{j=1}^{M} C_j G_j \right\} / \left\{ \sum_{j=1}^{M} C_j \right\} \text{ … for all S Semesters registered}$$

(ie., upto and inclusive of S Semesters, S ≥2),

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' for from the 1st Semester onwards upto and inclusive of the Semester S (obviously M > N), 'j' is the Subject indicator index (taking into account all Subjects from 1 to S Semesters), C_j is the no. of Credits allotted to the j^{th} Subject, and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that j^{th} Subject. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA

Course/Subject	Credits	Letter Grade	Grade points	Credit Points
Course 1	4	A	8	4*8 = 32
Course 2	4	O	10	4*10 = 40
Course 3	4	B	6	4*6 = 24
Course 4	3	B	6	3*6 = 18
Course 5	3	A+	9	3*9 = 27
Course 6	3	B	6	3*6 = 18
	21			159

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SGPA = 159/21 = 7.57

Illustration of calculation of CGPA

Semester	Credits	SGPA	Credits * SGPA
Semester I	24	7	24*7 = 168
Semester II	24	6	24*6 = 144
Semester III	24	6.5	24*6.5 = 156
Semester IV	24	6	24*6 = 144
	96		612

CGPA = 612/96 = 6.37

10.0 Award of Degree and Class

10.1 If a student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG Programme (PGP), and secures the required number of **68** Credits (with CGPA ≥6.0), shall be declared to have 'QUALIFIED' for the award of the M.Pharm. Degree in the chosen specialization of Pharmacy that he was admitted into.

10.2 Award of Class

After a student has earned the requirements prescribed for the completion of the programme and is eligible for the award of M.Pharm. Degree, he shall be placed in one of the following three classes based on the CGPA:

Class Awarded	CGPA
First Class with Distinction	≥ 7.75
First Class	6.75≤ CGPA < 7.75
Second Class	6.00≤ CGPA < 6.75

A student with final CGPA (at the end of the **PGP) < 6.00** shall not be eligible for the Award of Degree.

11.0 Withholding of Results

If the student has not paid the dues, if any, to the University or if any case of indiscipline is pending against him, the result and degree of the student will be withheld and he will not be allowed into the next semester.

12.0 General

12.1 **Credit**: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.

12.2 **Credit Point:** It is the product of grade point and number of credits for a course.

12.3 Wherever the words "he", "him", "his", occur in the regulations, they shall include "she", "her".

12.4 The academic regulation should be read as a whole for the purpose of any interpretation.

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12.5 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the University is final.

12.6 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

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MALPRACTICES RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject to the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. Incase of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject to the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already

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	answer book or additional sheet, during or after the examination.	appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent/ any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in- charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	Incase of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any par there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the

		remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractices)
   - (i) A show cause notice shall be issued to the college.
   - (ii) Impose a suitable fine on the college.
   - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

(Established by Act No. 30 of 2008)

Kukatpally, Hyderabad, Telangana (India).

ACADEMIC REGULATIONS OF B.PHARM. (REGULAR/FULL TIME) STUDENTS WITH EFFECT FROM THE ACADEMIC YEAR 2017-18 (R-17)

1.0 Under-Graduate Degree Programme in Pharmacy

1.1 JNTUH offers a 4-year (8 semesters) **Bachelor of Pharmacy** (B.Pharm.) degree programme, under Choice Based Credit System (CBCS) at its affiliated colleges with effect from the academic year 2017-18.

2.0 Eligibility for admission

2.1 Admission to the under graduate programme shall be made either on the basis of the merit rank obtained by the qualified candidate in entrance test conducted by the Telangana State Government (EAMCET) or the University or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the government from time to time.

2.2 The medium of instructions for the entire under graduate programme in Pharmacy will be **English** only.

3.0 B.Pharm. Programme structure

3.1 A student after securing admission shall pursue the under graduate programme in B.Pharm. in a minimum period of **four** academic years (8 semesters), and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester, failing which student shall forfeit seat in B.Pharm course.

A student shall register for all subjects for covering 196 credits and each student shall secure 196 credits (with CGPA $\geq$ 5) required for the completion of the under graduate programme and award of the B.Pharm. degree.

3.2 **UGC/ AICTE** specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations/ norms, which are listed below.

3.2.1 Semester scheme

Each under graduate programme is of 4 academic years (8 semesters) with the academic year being divided into two semesters of 22 weeks ($\geq$ 90 instructional days) each, each semester shall have - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester

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System (CBSS) as indicated by UGC and curriculum / course structure as suggested by AICTE are followed.

3.2.2 Credit courses

All subjects/ courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/ course in an L: T: P: C (lecture periods: tutorial periods: practical periods: credits) structure based on the following general pattern.

- One credit for one hour/ week/ semester for theory/ lecture (L) courses.
- One credit for two hours/ week/ semester for laboratory/ practical (P) courses or tutorials (T).

Courses like environmental science, human values and professional ethics, gender sensitization lab and other student activities like NCC/NSO and NSS are identified as mandatory courses. These courses will not carry any credits.

3.2.3 Subject Course Classification

All subjects/ courses offered for the under graduate programme in Pharmacy (B.Pharm. degree programmes) are broadly classified as follows. The university has followed almost all the guidelines issued by AICTE/UGC.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FnC)	BS – Basic Sciences	Includes mathematics, physics and chemistry subjects.
2		PS - Pharmaceutical Sciences	Includes fundamental Pharmacy Subjects.
3		HS – Humanities and Social sciences	Includes subjects related to humanities, social sciences and management.
4	Core Courses (CoC)	PC – Professional Core	Includes core subjects related to the parent discipline.
5	Elective Courses (EℓC)	OE – Open Electives	Includes elective subjects related to inter-disciplinary areas of Pharmacy or other than Pharmacy
6	Core Courses	Project Work	B.Pharm. project or UG project or UG major project
7		Seminar	Seminar/ Colloquium based on core contents related to parent discipline.
10	Minor courses	-	1 or 2 Credit courses (subset of HS)
11	Mandatory Courses (MC)	-	Mandatory courses (non-credit)

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4.0 Course registration

4.1 A 'faculty advisor or counselor' shall be assigned to a group of 15 students, who will advise student about the under graduate programme, its course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.

4.2 The academic section of the college invites 'registration forms' from students before the beginning of the semester through 'on-line registration', ensuring 'date and time stamping'. The on-line registration requests for any 'current semester' shall be **completed before the commencement of semester end examinations of the 'preceding semester'**.

4.3 A student can apply for **on-line** registration, **only after** obtaining the '**written approval**' from faculty advisor/counselor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with Head of the Department, faculty advisor/ counselor and the student.

4.4 If the student submits ambiguous choices or multiple options or erroneous entries during **on-line** registration for the subject(s) / course(s) under a given/ specified course group/ category as listed in the course structure, only the first mentioned subject/ course in that category will be taken into consideration.

4.5 Subject/ course options exercised through **on-line** registration are final and **cannot** be changed or inter-changed; further, alternate choices also will not be considered. However, if the subject/ course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to have alternate choice either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within the **first week** after the commencement of class-work for that semester.

4.6 Open Electives: Students have to choose one open elective (OE-I) in II year II semester, one (OE-II) in III year I semester, and one (OE-III) in III year II semester and one (OE-IV) in IV year II semester from the list of Open Electives.

5.0 Subjects/ courses to be offered

5.1 A typical section (or class) strength for each semester shall be 60.

5.2 A subject/ course may be offered to the students, **only if** a minimum of 20 students (1/3 of the section strength) opt for it. The maximum strength of a section is limited to 80 (60 + 1/3 of the section strength).

5.3 If more entries for registration of a subject come into picture, then the Head of Department concerned shall decide, whether or not to offer such a subject/ course for **two (or multiple) sections**.

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6.0 Attendance requirements:

6.1 Attendance in all classes (Lectures/Laboratories/Project Work) is compulsory. The minimum required attendance in aggregate of all the subjects/ courses including the attendance of mid-term examination / Laboratory etc. is 75%. Two periods of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject. A student shall not be permitted to appear for the Semester End Examinations (SEE), if his attendance is less than 75% (excluding attendance in mandatory courses environmental science, human values and professional ethics, gender sensitization Lab, NCC/NSO, NSS and Industrial Training) for that semester.

6.2 Condoning of shortage of attendance (between 65% and 75%) up to a maximum of 10% (considering the days of attendance in sports, games, NCC, NSS activities and Medical grounds) in each semester shall be granted by the College Academic Committee on genuine and valid grounds, based on the student's representation with supporting evidence.

6.3 A stipulated fee shall be payable towards condoning of shortage of attendance.

6.4 Shortage of attendance below 65% in aggregate shall in **no case be condoned**.

6.5 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled. They will not be promoted to the next semester. They may seek re-registration for all those subjects registered in that semester in which student was detained, by seeking re-admission into that semester as and when offered; in case if there are any open electives, the same may also be re-registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

6.6 A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

7.0 Academic requirements

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no.**6.**

7.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if student secures not less than 35% marks (26 out of 75 marks) in the semester end examination, and a minimum of 40% of marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing **'C'** grade or above in that subject/ course.

7.2 Promotion Rules

S. No.	Promotion	Conditions to be fulfilled
1	**First year first semester to first year second semester**	**Regular course of study of first year first semester.**

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2	**First year second semester to second year first semester**	**(i) Regular course of study of first year second semester.** **(ii) Must have secured at least 24 credits out of 48 credits i.e., 50% of credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.**
3.	**Second year first semester to second year second semester**	**Regular course of study of second year first semester.**
4	**Second year second semester to third year first semester**	**(i) Regular course of study of second year second semester.** **(ii) Must have secured at least 58 credits out of 96 credits i.e., 60% of credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.**
5	**Third year first semester to third year second semester**	**Regular course of study of third year first semester.**
6	**Third year second semester to fourth year first semester**	**(i) Regular course of study of third year second semester.** **(ii) Must have secured at least 86 credits out of 144 credits i.e., 60% of credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.**
7	**Fourth year first semester to fourth year second semester**	**Regular course of study of fourth year first semester.**

7.3 A student shall register for all subjects covering 196 credits as specified and listed in the course structure, fulfills all the attendance and academic requirements for 196 credits, 'earn all 196 credits' by securing SGPA ≥ 5.0 (in each semester) and CGPA (at the end of each successive semester) ≥ 5.0 to successfully complete the under graduate programme.

7.4 After securing the necessary 196 credits as specified for the successful completion of the entire under graduate programme, the student can avail exemption of two subjects up to 6 credits, that is, two open elective subjects for optional drop out from these 196 credits earned; resulting in 190 credits for under graduate programme performance evaluation, i.e., the performance of the student in these 190 credits shall alone be taken into account for the calculation of 'the final CGPA (at the end of under graduate programme, which takes the SGPA of the IV year II semester into account), and shall be indicated in the

grade card of IV year II semester. However, the performance of student in the earlier individual semesters, with the corresponding SGPA and CGPA for which grade cards have already been given will not be altered.

7.5 If a student registers for some more '**extra subjects'** other than those listed subjects totaling to 196 credits as specified in the course structure, the performances in those '**extra subjects**' (although evaluated and graded using the same procedure as that of the required 196 credits) will not be taken into account while calculating the SGPA and CGPA. For such '**extra subjects'** registered, % of marks and letter grade alone will be indicated in the grade card as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations 6 and 7.1 – 7.4 above.

7.6 A student eligible to appear in the end semester examination for any subject/ course, but absent from it or failed (thereby failing to secure **'C'** grade or above) may reappear for that subject/ course in the supplementary examination as and when conducted. In such cases, CIE assessed earlier for that subject/ course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that subject.

7.7 A student **detained in a semester due to shortage of attendance, may be re-admitted when the same semester is offered in the next academic year for fulfillment of academic requirements**. The academic regulations under which student has been readmitted shall be applicable. However, no grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which student has been detained.

7.8 A student detained **due to lack of credits, shall be promoted to the next academic year only after acquiring the required academic credits.** The academic regulations under which student has been readmitted shall be applicable to him.

Note: (1) The SGPA will be computed and printed on the marks memo only if the candidate passes in all the subjects offered and gets minimum B grade in all the subjects.

(2) CGPA is calculated only when the candidate passes in all the subjects offered in all the semesters.

8.0 Evaluation - Distribution and Weightage of marks

8.1 The performance of a student in every subject/course (including practicals and UG major project) will be evaluated for 100 marks each, with 25 marks allotted for CIE (Continuous Internal Evaluation) and 75 marks for SEE (Semester End-Examination).

8.2 For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term examination consists of one objective paper, one descriptive paper and one assignment. The objective paper and the essay paper shall be for 10 marks each with a total duration of 1 hour 20 minutes (20 minutes for objective and 60 minutes for essay paper). The objective paper is set with 20 bits of multiple choice, fill-in the blanks and matching type of questions for a total of 10 marks. The essay paper shall contain 4 full

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questions out of which, the student has to answer 2 questions, each carrying 5 marks. While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus. Five marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-examination, and the second assignment should be submitted before the conduct of the second mid-examination. The total marks secured by the student in each mid-term examination are evaluated for 25 marks, and the average of the two mid-term examinations shall be taken as the final marks secured by each student in internals/sessionals. If any student is absent from any subject of a mid-term examination, an on-line test will be conducted for him by the university. The details of the question paper pattern are as follows,

- The end semester examinations will be conducted for 75 marks consisting of two parts viz. i) **Part- A** for 25 marks, ii) **Part - B** for 50 marks.
- Part-A is compulsory question which consists of ten sub-questions. The first five sub-questions are from each unit and carry 2 marks each. The next five sub-questions are one from each unit and carry 3 marks each.
- Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

8.3 For practical subjects there shall be a continuous internal evaluation during the semester for 25 sessional marks and 75 semester end examination marks. Out of the 25 marks for internal evaluation, day-to-day work in the laboratory shall be evaluated for 15 marks and internal practical examination shall be evaluated for 10 marks conducted by the laboratory teacher concerned. The semester end examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the clusters of colleges which are decided by the examination branch of the university.

8.4 There shall be an Industrial Training in IV year I semester. For the Industrial Training, the student shall be required to work for at least 150 hours spread over four weeks in a Pharmaceutical Industry/Hospital. It includes Production unit, Quality Control department, Quality Assurance department, Analytical laboratory, Chemical manufacturing unit, Pharmaceutical R&D, Hospital (Clinical Pharmacy), Clinical Research Organization, Community Pharmacy, etc. After the IV year I semester and before the commencement of IV year II semester, the student shall submit satisfactory report of the work and certificate duly signed by the authority of training organization to the head of the institute.

8.5 **Practice School:** In the IV year I semester, every candidate shall undergo a practice school for a period of 150 hours evenly distributed throughout the semester. The student

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shall opt any one of the domains for practice school declared by the departmental committee from time to time. At the end of the practice school, every student shall submit a printed report (in triplicate) on the practice school he/she attended (not more than 25 pages). The report shall be submitted to the departmental committee consisting of Head of the Institution, Head of the Department and a senior faculty member. The practice school report shall be evaluated for 100 marks and grade point shall be awarded.

8.6 Out of a total of 100 marks for the UG major project, 25 marks shall be allotted for internal evaluation and 75 marks for the end semester examination (viva voce). The end semester examination of the project work shall be conducted by a committee consisting of external examiner, Head of the Department, supervisor of the project and a senior faculty member. The evaluation of UG major project shall be made at the end of IV year II semester. The internal evaluation shall be on the basis of two seminars given by each student on the topic of UG major project.

8.7 The laboratory marks and the sessional marks awarded by the college are subject to scrutiny and scaling by the university wherever necessary. In such cases, the sessional and laboratory marks awarded by the college will be referred to a committee. The committee will arrive at a scaling factor and the marks will be scaled accordingly. The recommendations of the committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective institutions as per the university rules and produced before the committees of the university as and when asked for.

8.8 For mandatory courses environmental science, human values and professional ethics, gender sensitization lab and Industrial Training a student has to secure 40 marks out of 100 marks (i.e. 40% of the marks allotted) in the continuous internal evaluation for passing the subject/course.

8.9 For mandatory courses NCC/ NSO and NSS, a 'satisfactory participation certificate' shall be issued to the student from the authorities concerned, only after securing ≥ 65% attendance in such a course.

8.10 No marks or letter grade shall be allotted for all mandatory/non-credit courses.

9.0 Grading procedure

9.1 Marks will be awarded to indicate the performance of student in each theory subject, laboratory / practicals and UG major project. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.

9.2 As a measure of the performance of student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	O (Outstanding)	10

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80 and less than 90%	**A^+ (Excellent)**	**9**
70 and less than 80%	**A (Very Good)**	**8**
60 and less than 70%	**B^+ (Good)**	**7**
50 and less than 60%	**B (Average)**	**6**
40 and less than 50%	**C (Pass)**	**5**
Below 40%	**F (FAIL)**	**0**
Absent	**Ab**	**0**

9.3 A student obtaining '**F**' grade in any subject shall be deemed to have '**failed**' and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

9.4 A student who has not appeared for examination in any subject, '**Ab**' grade will be allocated in that subject, and student shall be considered '**failed**'. Student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered.

9.5 A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

9.6 A student earns grade point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding 'credit points' (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

Credit points (CP) = grade point (GP) x credits …. For a course

9.7 The student passes the subject/ course only when **GP ≥ 5 ('C' grade or above)**

9.8 The semester grade point average (SGPA) is calculated by dividing the sum of credit points (ΣCP) secured from all subjects/ courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to **two** decimal places. SGPA is thus computed as

SGPA = $\{ \sum_{i=1}^{N} C_i G_i \} / \{ \sum_{i=1}^{N} C_i \}$ …. For each semester,

where 'i' is the subject indicator index (takes into account all subjects in a semester), 'N' is the no. of subjects '**registered**' for the semester (as specifically required and listed under the course structure of the parent department), C_i is the no. of credits allotted to the i^{th} subject, and G_i represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} subject.

9.9 The cumulative grade point average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in **all** registered courses in **all** semesters, and the total number of credits registered in **all** the semesters. CGPA is rounded off to **two** decimal places. CGPA is thus computed from the I year II semester onwards at the end of each semester as per the formula

CGPA = $\{ \sum_{j=1}^{M} C_j G_j \} / \{ \sum_{j=1}^{M} C_j \}$ … for all S semesters registered

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(i.e., up to and inclusive of S semesters, S ≥ 2),

where '**M'** is the **total** no. of subjects the student has '**registered'** i.e., from the 1st semester onwards up to and inclusive of the 8th semester, 'j' is the subject indicator index (takes into account all subjects from 1 to 8 semesters), C_j is the no. of credits allotted to the j^{th} subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} subject. After registration and completion of first year first semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA

Course/Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	4	O	10	4 x 10 = 40
Course 3	4	C	5	4 x 5 = 20
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	3	C	5	3 x 5 = 15
	Total Credits = 21			Total Credit Points = 152

SGPA = 152/21 = 7.24

Illustration of calculation of CGPA

Course/Subject	Credits	Letter Grade	Grade Points	Credit Points
I Year I Semester				
Course 1	4	A	8	4 x 8 = 32
Course 2	4	A+	9	4 x 9 = 36
Course 3	4	B	6	4 x 6 = 24
Course 4	3	O	10	3 x 10 = 30
Course 5	3	B+	7	3 x 7 = 21
Course 6	3	A	8	3 x 8 = 24
I Year II Semester				
Course 7	4	B+	7	4 x 7 = 28
Course 8	4	O	10	4 x 10 = 40
Course 9	4	A	8	4 x 8 = 32
Course 10	3	B	6	3 x 6 = 18
Course 11	3	C	5	3 x 5 = 15
Course 12	3	A+	9	3 x 9 = 27
	Total Credits = 42			Total Credit Points = 327

CGPA = 327/42 = 7.79

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9.10 For merit ranking or comparison purposes or any other listing, **only** the '**rounded off'** values of the CGPAs will be used.

9.11 For calculations listed in regulations 9.6 to 9.9, performance in failed subjects/ courses (securing **F** grade) will also be taken into account, and the credits of such subjects/ courses will also be included in the multiplications and summations. After passing the failed subject(s) newly secured letter grades will be taken into account for calculation of SGPA and CGPA. However, mandatory courses will not be taken into consideration.

10.0 Passing standards

10.1 A student shall be declared successful or 'passed' in a semester, if student secures a GP≥5 ('C' grade or above) in every subject/course in that semester (i.e. when student gets an SGPA ≥ 5.00 at the end of that particular semester); and a student shall be declared successful or 'passed' in the entire under graduate programme, only when gets a CGPA≥5.00 for the award of the degree as required.

10.2 After the completion of each semester, a grade card or grade sheet (or transcript) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, and grade earned etc.), credits earned, SGPA, and CGPA.

11.0 Declaration of results

11.1 Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.

11.2 For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

% of Marks = (final CGPA – 0.5) x 10

12.0 Award of degree

12.1 A student who registers for all the specified subjects/ courses as listed in the course structure and secures the required number of 196 credits (with CGPA ≥ 5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have '**qualified'** for the award of the B.Pharm. degree.

12.2 A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.

12.3 Students with final CGPA (at the end of the under graduate programme) ≥ 8.00, and fulfilling the following conditions -

(i) Should have passed all the subjects/courses in '**first appearance'** within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.

(ii) Should have secured a CGPA ≥ 8.00, at the end of each of the 8 sequential semesters, starting from first year first semester onwards.

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(iii) Should not have been detained or prevented from writing the end semester examinations in any semester due to shortage of attendance or any other reason, shall be placed in '**first class with distinction'**.

12.4 Students with final CGPA (at the end of the under graduate programme) ≥ 6.50 but < 8.00, shall be placed in '**first class'**.

12.5 Students with final CGPA (at the end of the under graduate programme) ≥ 5.50 but < 6.50, shall be placed in '**second class'**.

12.6 All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the under graduate programme) ≥ 5.00 but < 5.50, shall be placed in '**pass class**'.

12.7 A student with final CGPA (at the end of the under graduate programme) < 5.00 will not be eligible for the award of the degree.

12.8 Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of '**university rank**' and '**gold medal**'.

13.0 Withholding of results

13.1 If the student has not paid the fees to the university/ college at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

14.0 Transitory regulations

A. **For students detained due to shortage of attendance**:

1. A Student who has been detained in I year of R09/R13/R15/R16 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R17 Regulations and he is required to complete the study of B. Pharmacy programme within the stipulated period of eight academic years from the date of first admission in I Year.
2. A student who has been detained in any semester of II, III and IV years of R09/R13/R15/ R16 regulations for want of attendance, shall be permitted to join the corresponding semester of R17 regulations and is required to complete the study of B. Pharmacy within the stipulated period of eight academic years from the date of first admission in I Year. The R17 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester.

   See rule (C) for further Transitory Regulations.

B. **For students detained due to shortage of credits**:

3. A student of R09/R13/R15/R16 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of R17 Regulations only after acquiring the required credits as per the corresponding regulations of his/her first admission. The student is required to complete the study of B. Pharmacy within the stipulated period of

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eight academic years from the year of first admission. The R17 Academic Regulations are applicable to a student from the year of readmission onwards.

See rule (C) for further Transitory Regulations.

C. **For readmitted students in R17 Regulations**:

4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including R17 Regulations. The performance evaluation of the student will be done after the exemption of two subjects if total credits acquired are ≤ 206, three subjects if total credits acquired are > 206 (see R17 Regulations for exemption details).
6. If a student readmitted to R17 Regulations, has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R17 Regulations will be substituted by another subject to be suggested by the University.

Note: If a student readmitted to R17 Regulations, has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in R17 Regulations, the College Principals concerned shall conduct remedial classes to cover those subjects/topics for the benefit of the students.

15.0 Student transfers

15.1 There shall be no branch transfers after the completion of admission process.

15.2 There shall be no transfers from one college/stream to another within the constituent colleges and units of Jawaharlal Nehru Technological University Hyderabad.

15.3 The students seeking transfer to colleges affiliated to JNTUH from various other Universities/institutions have to pass the failed subjects which are equivalent to the subjects of JNTUH, and also pass the subjects of JNTUH which the students have not studied at the earlier institution. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of JNTUH, the students have to study those subjects in JNTUH in spite of the fact that those subjects are repeated.

15.4 The transferred students from other Universities/institutions to JNTUH affiliated colleges who are on rolls to be provide one chance to write the CBT (internal marks) in the **failed subjects and/or subjects not studied** as per the clearance letter issued by the university.

15.5 The autonomous affiliated colleges have to provide one chance to write the internal examinations in the **failed subjects and/or subjects not studied,** to the students transferred from other universities/institutions to JNTUH autonomous affiliated colleges who are on rolls, as per the clearance (equivalence) letter issued by the University.

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16.0 Scope

16.1 The academic regulations should be read as a whole, for the purpose of any interpretation.

16.2 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

16.3 The university may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the date notified by the university authorities.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

(Established by Act No. 30 of 2008)

Kukatpally, Hyderabad, Telangana (India).

Academic Regulations for B.Pharm. (Lateral Entry Scheme) w.e.f the AY 2018-19

1. Eligibility for award of B. Pharm. Degree (LES)

The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.

2. The student shall register for 147 credits and secure 147 credits with CGPA ≥ 5 from II year to IV year B.Pharm. programme (LES) for the award of B.Pharm. degree. **Out of the 147 credits secured, the student can avail exemption up to 6 credits**, that is, two open elective subjects resulting in 141 credits for B.Pharm programme performance evaluation**.**

3. The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Pharm.

4. The attendance requirements of B. Pharm. (Regular) shall be applicable to B.Pharm. (LES).

5. Promotion rule

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 29 credits out of 48 credits i.e., 60% of credits up

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		to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	**Third year first semester to third year second semester**	**Regular course of study of third year first semester.**
4	**Third year second semester to fourth year first semester**	**(i) Regular course of study of third year second semester.** **(ii) Must have secured at least 58 credits out of 96 credits i.e., 60% of credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.**
5	**Fourth year first semester to fourth year second semester**	**Regular course of study of fourth year first semester.**

6. All the other regulations as applicable to B. Pharm. 4-year degree course (Regular) will hold good for B. Pharm. (Lateral Entry Scheme).

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractice/Improper conduct	Punishment
	If the student:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which student is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an

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	communicates through cell phones with any student or persons in or outside the exam hall in respect of any matter.	outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The hall ticket of the student is to be cancelled and sent to the university.
3.	Impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and UG major project) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.

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6.	Refuses to obey the orders of the chief superintendent/assistant – superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.
9.	If student of the college, who is not a student for the particular examination or	Student of the colleges expulsion from the examination hall and cancellation of the

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	any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	performance in that subject and all other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the student has appeared including practical examinations and UG major project of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the university for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the students as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
   a. A show cause notice shall be issued to the college.
   b. Impose a suitable fine on the college.
   c. Shifting the examination centre from the college to another college for a specific period of not less than one year.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

(Established by Act No.30 of 2008)
Kukatpally, Hyderabad–500085, Telangana State (India)

Academic Regulations of M.Pharm (Regular/Full Time) Programmes, 2017-18 (R17) (CBCS)

(Effective for the students admitted into I year from the Academic Year 2017-18 and onwards)

1.0 **Post-Graduate Degree Programmes in Pharmacy (PGP in Pharmacy)** Jawaharlal Nehru Technological University Hyderabad (JNTUH) offers **Two** Years (**Four** Semesters) full-time Master of Pharmacy (M.Pharm.) Degree programmes, under Choice Based Credit System (CBCS) at its constituent (non- autonomous) and affiliated colleges in different specializations.

2.0 **Eligibility for Admissions**

2.1 Admission to the PGPs shall be made subject to eligibility, qualification and specializations prescribed by the University from time to time, for each specialization under each M.Pharm programme.

2.2 Admission to the post graduate programme shall be made on the basis of either the merit rank or Percentile obtained by the qualified student in the relevant qualifying GPAT Examination/ the merit rank obtained by the qualified student in an entrance test conducted by Telangana State Government (PGECET) for M.Pharm. programmes / an entrance test conducted by JNTUH/ on the basis of any other exams approved by the University, subject to reservations as laid down by the Govt. from time to time.

2.3 The medium of instructions for all PG Programmes will be **ENGLISH** only.

3.0 **M. Pharm. Programme (PGP in Pharmacy) Structure**

3.1 The M.Pharm Programmes in Pharmacy of JNTUH are of Semester pattern, with **Four** Semesters consisting of **Two** academic years, each academic year having **Two** Semesters (First/Odd and Second/Even Semesters). Each Semester shall be of 22 weeks duration (inclusive of Examinations), with a minimum of 90 instructional days per Semester.

3.2 The student shall not take more than four academic years to fulfill all the academic requirements for the award of M.Pharm. degree from the date of commencement of first year first semester, failing which the student shall forfeit the seat in M.Pharm. programme.

3.3 **UGC/AICTE** specified definitions/descriptions are adopted appropriately for various terms and abbreviations used in these PG academic regulations, as listed below:

3.3.1 **Semester Scheme**

Each Semester shall have 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) are taken as 'references' for the present set of Regulations. The terms 'SUBJECT' and 'COURSE' imply the same meaning here and refer to 'Theory Subject', or 'Lab Course', or 'Seminar', or 'Comprehensive Viva', or 'Project' as the case may be.

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3.3.2 Credit Courses

All subjects/courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/course in an L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods: Credits) structure based on the following general pattern:

- One credit for one hour/week/semester for theory/lecture (L) courses
- One credit for two hours/ week/semester for laboratory/ practical (P) courses or tutorials (T)

Other student activities like study tour, guest lecture, conference/workshop participations, technical paper presentations, and identified mandatory courses, if any, will not carry credits.

3.3.3 Subject Course Classification

All subjects/courses offered for the Post-Graduate Programme in Pharmacy (M.Pharm. Degree Programme) are broadly classified as follows. The University has followed in general the guidelines issued by AICTE/UGC.

S.No.	Broad Course Classification	Course Group/ Category	Course Description
1	Core Courses (CoC)	PC- Professional Core	Includes subjects related to the parent discipline/ department
		Project Work	M.Pharm Project or PG Project or Major Project
		Seminar	Seminar/Colloquium based on core contents related to parent discipline/department
		Comprehensive Viva-Voce	Viva-voce covering all the PG subjects studied during the course work and related aspects
2	Elective Courses (ElE)	PE - Professional Electives	Includes elective subjects related to the parent discipline/ department
		OE - Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline/ department
Total number of Credits			

4.0 Course Registration

4.1 A 'Faculty Advisor or Counselor' shall be assigned to each specialization, who will advise on the Post Graduate Programme (PGP), its Course Structure and Curriculum, Choice/Option for Subjects/ Courses, based on his competence, progress, pre-requisites and interest.

4.2 The Academic Section of the College invites 'Registration Forms' from students within 15 days from the commencement of class work through 'ON-LINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ON-LINE Registration Requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

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4.3 A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his Faculty Advisor, which should be submitted to the College Academic Section through the Head of Department (a copy of it being retained with Head of Department, Faculty Advisor and the Student).

4.4 If the Student submits ambiguous choices or multiple options or erroneous entries during ON-LINE Registration for the Subject(s) / Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, only the first mentioned Subject/ Course in that Category will be taken into consideration.

4.5 Subject/ Course Options exercised through ON-LINE Registration are final and CANNOT be changed, nor can they be inter-changed; further, alternate choices also will not be considered. However, if the Subject/ Course that has already been listed for Registration by the University in a Semester could not be offered due to unforeseen or unexpected reasons, then the Student will be allowed to have alternate choice either for a new Subject, if it is offered, or for another existing Subject (subject to availability of seats). Such alternate arrangements will be made by the Head of Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

5.0 Attendance Requirements

The programmes are offered on the basis of a unit system with each subject being considered a unit.

5.1 Attendance in all classes (Lectures/Laboratories/Seminar) is compulsory. The minimum required attendance in each theory including the attendance of mid-term examination / Laboratory etc. is 75%. Two periods of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject. A student shall not be permitted to appear for the Semester End Examinations (SEE), if his attendance is less than 75%.

5.2 A student's seminar report and seminar presentation will be eligible for evaluation, only if he ensures a minimum of 75% of his attendance in seminar presentation classes during that semester.

5.3 **Condoning of shortage of attendance** (between 65% and 75%) up to a maximum of 10% (considering the days of attendance in sports, games, NCC, NSS activities and Medical grounds) in each subject of a semester shall be granted by the College Academic Committee.

5.4 Shortage of Attendance below 65% in any subject shall in **no case be condoned.**

5.5 A Student, whose shortage of attendance **is not condoned** in any subject(s) in any semester, is considered detained in that subject(s) and is not eligible to write Semester End Examination(s) of such subject(s) in that semester, and he has to seek re-registration for those subject(s) in subsequent semesters, and attend the same as and when offered.

5.6 A student fulfills the attendance requirement in the present semester, shall not be eligible for readmission into the same class.

5.7 A prescribed fee per subject shall be payable for condoning shortage of attendance.

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5.8 A student shall put in a minimum required attendance in at least three theory subjects in I Year I semester for promotion to I Year II Semester.

6.0 Academic Requirements

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no. 5. The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks per subject / course (theory / practical), on the basis of Internal Evaluation and Semester End Examination.

6.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course, if he secures not less than 40% of marks (30 out of 75 marks) in the End Semester Examination, and a minimum of 50% of marks in the sum total of CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades and this implies securing 'B' Grade or above in a subject.

6.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to a subject/ course, if he secures not less than 50% of the total marks. The student is deemed to have failed, if he (i) does not attend the comprehensive viva-voce as per the schedule given, or (ii) does not present the seminar as required. In such a case, he may reappear for comprehensive viva-voce in supplementary examinations and for seminar in the subsequent semesters, as and when scheduled.

6.3 A student shall register for all subjects for total of 88 credits as specified and listed in the course structure for the chosen specialization, put in required the attendance and fulfill the academic requirements for securing 88 credits obtaining a minimum of 'B' Grade or above in each subject, and all 88 credits securing Semester Grade Point Average **(SGPA) ≥6.0** (in each semester) and final Cumulative Grade Point Average **(CGPA)** (i.e., **CGPA at the end of PGP) ≥ 6.0**, to complete the PGP successfully.

Note: (1) The SGPA will be computed and printed on the marks memo only if the candidate passes in all the subjects offered and gets minimum B grade in all the subjects.

(2) CGPA is calculated only when the candidate passes in all the subjects offered in all the semesters

6.4 Marks and Letter Grades obtained in all those subjects covering the above specified 88 credits alone shall be considered for the calculation of final CGPA, which will be indicated in the Grade Card /Marks Memo of second year second semester.

6.5 If a student registers for extra subject(s) (in the parent department or other departments/ branches of Engineering) other than those listed subjects totaling to 88 credits as specified in the course structure, the performance in extra subject(s) (although evaluated and graded using the same procedure as that of the required 88 credits) will not be taken into account while calculating the SGPA and CGPA. For such extra subject(s) registered, percentage of marks and Letter Grade alone will be indicated in the Grade Card/Marks Memo, as a performance measure, subject to completion of the attendance and academic requirements as stated in items 5 and 6.1 - 6.3.

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6.6 When a student is detained due to shortage of attendance in any subject(s) in any semester, no Grade allotment will be made for such subject(s). However, he is eligible for re-registration of such subject(s) in the subsequent semester(s), as and when next offered, with the academic regulations of the batch into which he is re-registered, by paying the prescribed fees per subject. In all these re-registration cases, the student shall have to secure a fresh set of internal marks and Semester End Examination marks for performance evaluation in such subject(s), and SGPA/CGPA calculations.

6.7 A student eligible to appear for the Semester End Examination in any subject, but absent from it or failed (failing to secure 'B' Grade or above), may reappear for that subject at the supplementary examination as and when conducted. In such cases, his internal marks assessed earlier for that subject will be carried over, and added to the marks secured in the supplementary examination, for the purpose of evaluating his performance in that subject.

6. 8 A Student who fails to earn 88 credits as per the specified course structure, and as indicated above, within **four** academic years from the date of commencement of his first year first semester, shall forfeit his seat in M.Pharm. programme and his admission **shall stand cancelled.**

7.0 Evaluation - Distribution and Weightage of Marks

The performance of a student in each semester shall be evaluated subject- wise (irrespective of credits assigned) for a maximum of 100 marks. The M. Pharm. project work (major project) will also be evaluated for 100 marks.

7.1 For the theory subjects 75 marks shall be awarded for the performance in the Semester End Examination and 25 marks shall be awarded for Continuous Internal Evaluation (CIE). The Continuous Internal Evaluation shall be made based on the average of the marks secured in the two Mid-Term Examinations conducted, first Mid-Term examinations in the middle of the Semester and second Mid-Term examinations during the last week of instruction. Each Mid-Term Examination shall be conducted for a total duration of 120 minutes with Part 'A' as compulsory consisting of 5 questions carrying 2 marks each (10 marks), and Part 'B' with 3 questions to be answered out of 5 questions, each question carrying 5 marks (15 marks). The details of the Question Paper pattern for Semester End Examination (Theory) are given below:

- The Semester End Examination will be conducted for 75 marks. It consists of two parts. i) Part A for 25 marks, ii) Part B for 50 marks.
- Part A is compulsory and consists of 5 questions, one from each unit and carrying 5 marks each.
- Part B consists of 5 questions carrying 10 marks each. There will be two questions from each unit and only one should be answered.

7.2 For practical subjects, 75 marks shall be awarded for performance in the Semester End Examinations and 25 marks shall be awarded for day-to-day performance as Internal Marks.

7.3 For conducting laboratory end examinations of all PG Programmes, one internal examiner and one external examiner are to be appointed by the Principal of the College and this is to be informed to the Director of Evaluation of JNTUH within two weeks, before

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commencement of the lab end examinations. The external examiner should be selected from outside the College concerned but within the cluster. No external examiner should be appointed from any other College in the same cluster/any other cluster which is run by the same Management.

7.4 There shall be two seminar presentations during I year I semester and II semester respectively. For seminar, a student shall collect the literature on the advanced topic in relevant fields and critically review the literature and submit it to the department in a form of report and shall make an oral presentation before the Department Academic Committee consisting of Head of the Department, seminar coordinator and two other senior faculty members of the department. For each Seminar there will be only internal evaluation for 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful. If he fails to obtain the minimum mark, he has to reappear for the seminar during the supplementary examinations. The word 'Seminar' implies presentation of Technical Report, presentation/ discussion on the state of Art of Technology.

7.5 There shall be a Comprehensive Viva-Voce in II year I Semester. The Comprehensive Viva-Voce is intended to assess the student's understanding of various subjects he has studied during the M.Pharm. course of study. The Head of the Department shall be associated with the conduct of the Comprehensive Viva-Voce through a Committee. The Committee shall consist of Head of the Department, one senior faculty member and an external examiner. The external examiner shall be appointed by the Principal of the college concerned and this is to be informed to the Director of Evaluation of JNTUH within two weeks. The external examiner should be selected from outside the College concerned but within the cluster. No external examiner should be appointed from any other College in the same cluster/any other cluster which is run by the same Management. There are no internal marks for the Comprehensive Viva-Voce and it is evaluated for a maximum of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful. If he fails to obtain the minimum marks, he has to reappear for the viva-voce during the supplementary examinations.

7.6 Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

7.7 A Project Review Committee (PRC) shall be constituted with the Head of the Department as Chairperson, Project Supervisor and one senior faculty member of the Departments offering the M.Pharm. programme.

7.8 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement in all the subjects, both theory and practicals.

7.9 After satisfying 7.8, a candidate has to present in Project Work Review I, in consultation with his Project Supervisor, the title, objective and plan of action of his project work to the Project Work Review Committee (PRC) for approval within four weeks from the commencement of Second year First Semester. Only after obtaining the approval of the PRC can the student initiate the Project work.

7.10 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the PRC. However, the PRC shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

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7.11 A candidate shall submit his project progress report in two stages at least with a gap of **three** months between them.

7.12 The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of all theory and practical courses with the approval of PRC not earlier than 40 weeks from the date of approval of the project work. For the approval of PRC the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.

7.13 The Project Work Review II in II Year I Sem. carries internal marks of 100. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate the work for the other 50 marks. The Supervisor and PRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain and progress of the Project Work. A candidate has to secure a minimum of 50% of marks to be declared successful in Project Work Review II. If he fails to obtain the minimum required marks, he has to reappear for Project Work Review II as and when conducted.

7.14 The Project Work Review III in II Year II Sem. carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate it for the other 50 marks. The PRC will examine the overall progress of the Project Work and decide whether or not the Project is eligible for final submission. A candidate has to secure a minimum of 50% of marks to be declared successful in Project Work Review III. If he fails to obtain the required minimum marks, he has to reappear for Project Work Review III as and when conducted. For Project Evaluation (Viva Voce) in II Year II Sem. there are external marks of 100 and it is evaluated by the external examiner. The candidate has to secure a minimum of 50% marks in Project Evaluation (Viva-Voce) examination.

7.15 Project Work Reviews II and III shall be conducted in phase I (Regular) and Phase II (Supplementary). Phase II will be conducted only for unsuccessful students in Phase I. The unsuccessful students in Project Work Review II (Phase II) shall reappear for it at the time of Project Work Review III (Phase I). These students shall reappear for Project Work Review III in the next academic year at the time of Project Work Review II only after completion of Project Work Review II, and then Project Work Review III follows. The unsuccessful students in Project Work Review III (Phase II) shall reappear for Project Work Review III in the next academic year only at the time of Project Work Review II (Phase I).

7.16 After approval from the PRC, a soft copy of the thesis should be submitted for ANTI-PLAGIARISM check and the plagiarism report should be submitted to the University and be included in the final thesis. The Thesis will be accepted for submission, if the similarity index is less than **30%**. If the similarity index has more than the required percentage, the student is advised to modify accordingly and re-submit the soft copy of the thesis after one month. The maximum number of re-submissions of thesis after plagiarism check is limited to TWO. The candidate has to register for the Project work and work for two semesters. After three attempts, the admission is liable to be cancelled. The college authorities are advised to make plagiarism check of every soft copy of theses before submissions.

7.17 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College/School/Institute, after submission of a research paper related to the project work in a UGC approved journal. A copy of the submitted research paper shall be attached to thesis.

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7.18 The thesis shall be adjudicated by an external examiner selected by the University. For this, the Principal of the College/School/Institute shall submit a panel of **three** examiners from among the list of experts in the relevant specialization as submitted by the supervisor concerned and Head of the Department.

7.19 If the report of the external examiner is unsatisfactory, the candidate shall revise and resubmit the Thesis. If the report of the examiner is unsatisfactory again, the thesis shall be summarily rejected. Subsequent actions for such dissertations may be considered, only on the specific recommendations of the external examiner and /or Project work Review Committee. No further correspondence in this matter will be entertained, if there is no specific recommendation for resubmission.

7.20 If the report of the examiner is satisfactory, the Head of the Department shall coordinate and make arrangements for the conduct of Project Viva- Voce examination. The Project Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who adjudicated the Thesis. The candidate has to secure a minimum of 50% of marks in Project Evaluation (Viva-Voce) examination.

7.21 If he fails to fulfill the requirements as specified in 7.20, he will reappear for the Viva-Voce examination only after three months. In the reappeared examination also, if he fails to fulfill the requirements, he will not be eligible for the award of the degree, unless he is asked to revise and resubmit his project work by the board within a specified time period (within **four** years from the date of commencement of his first year first semester).

7.22 The Project Viva-Voce External examination marks must be submitted to the University on the day of the examination.

8.0 Re-Admission/Re-Registration

8.1 Re-Admission for Discontinued Student

A student, who has discontinued the M. Pharm. degree programme due to any reason whatsoever, may be considered for '**readmission**' into the same degree programme (with the same specialization) with the academic regulations of the batch into which he gets readmitted, with prior permission from the authorities concerned, subject to item 6.6.

8.2 If a student is detained in a subject (s) due to shortage of attendance in any semester, he may be permitted to **re-register** for the same subject(s) in the same category (core or elective group) or equivalent subject, if the same subject is not available, as suggested by the Board of Studies of that department, as and when offered in the subsequent semester(s), with the academic regulations of the batch into which he seeks re-registration, with prior permission from the authorities concerned, subject to item 3.2

8.3 A candidate shall be given one chance to re-register for a maximum of two subjects, if the internal marks secured by a candidate are less than 50% and failed in those subjects. A candidate must re-register for failed subjects within four weeks of commencement of the class work and secure the required minimum attendance. In the event of the student taking this chance, his Continuous Internal Evaluation (internal) marks and Semester End Examination marks obtained in the previous attempt stand cancelled.

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9.0 Examinations and Assessment - The Grading System

9.1 Grades will be awarded to indicate the performance of each student in each Theory Subject, or Lab/Practicals, or Seminar, or Project, etc., based on the % of marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 7 above, and a corresponding Letter Grade shall be given.

9.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
90% and above (≥ 90% , ≤ 100%)	O (Outstanding)	10
Below 90% but not less than 80% (≥80% , <90%)	A^+ (Excellent)	9
Below 80% but not less than 70% (≥70% , <80%)	A (Very Good)	8
Below 70% but not less than 60% (≥60% , <70%)	B^+ (Good)	7
Below 60% but not less than 50% (≥ 50% , <60%)	B (above Average)	6
Below 50% (< 50%)	F (FAIL)	0
Absent	**Ab**	**0**

9.3 A student obtaining F Grade in any Subject is deemed to have 'failed' and is required to reappear as 'Supplementary Candidate' for the Semester End Examination (SEE), as and when conducted. In such cases, his Internal Marks (CIE Marks) in those subjects will remain as obtained earlier.

9.4 If a student has not appeared for the examinations, 'Ab' Grade will be allocated to him for any subject and shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' for the Semester End Examination (SEE), as and when conducted.

9.5 A Letter Grade does not imply any specific marks percentage; it is only the range of percentage of marks.

9.6 In general, a student shall not be permitted to repeat any Subject/ Course (s) only for the sake of 'Grade Improvement' or 'SGPA/ CGPA Improvement'.

9.7 A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course. The corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ Course.

Credit Points (CP) = Grade Point (GP) x Credits …. For a Course

9.8 The student passes the Subject/ Course only when he **gets GP ≥6 (B Grade or above).**

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9.9 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL Subjects/ Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

$$\textbf{SGPA} = \{ \textstyle\sum_{i=1}^{N} C_i G_i \} / \{ \sum_{i=1}^{N} C_i \} \text{ .... For each Semester,}$$

where 'i' is the Subject indicator index (taking into account all Subjects in a Semester), 'N' is the no. of Subjects 'REGISTERED' for the Semester (as specifically required and listed under the Course Structure of the parent Department), C_i is the no. of Credits allotted to the i^{th} Subject, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that i^{th} Subject.

9.10 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all Semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the I Year Second Semester onwards, at the end of each Semester, as per the formula

$$\textbf{CGPA} = \{ \textstyle\sum_{j=1}^{M} C_j G_j \} / \{ \sum_{j=1}^{M} C_j \} \text{ ... for all S Semesters registered}$$

(ie., upto and inclusive of S Semesters, S ≥2),

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' for from the 1st Semester onwards upto and inclusive of the Semester S (obviously M > N), 'j' is the Subject indicator index (taking into account all Subjects from 1 to S Semesters), C_j is the no. of Credits allotted to the j^{th} Subject, and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that j^{th} Subject. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA

Course/Subject	Credits	Letter Grade	Grade points	Credit Points
Course 1	4	A	8	4*8 = 32
Course 2	4	O	10	4*10 = 40
Course 3	4	B	6	4*6 = 24
Course 4	3	B	6	3*6 = 18
Course 5	3	A+	9	3*9 = 27
Course 6	3	B	6	3*6 = 18
	21			159

SGPA = 159/21 = 7.57

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Illustration of calculation of CGPA

Semester	Credits	SGPA	Credits * SGPA
Semester I	24	7	24*7 = 168
Semester II	24	6	24*6 = 144
Semester III	24	6.5	24*6.5 = 156
Semester IV	24	6	24*6 = 144
	96		612

CGPA = 612/96 = 6.37

10.0 Award of Degree and Class

10.1 If a student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG Programme (PGP), and secures the required number of **88** Credits (with CGPA ≥6.0), shall be declared to have 'QUALIFIED' for the award of the M.Pharm. Degree with the specialization that he was admitted into.

10.2 Award of Class

After a student has earned the requirements prescribed for the completion of the programme and is eligible for the award of M.Pharm. Degree, he shall be placed in one of the following three classes based on the CGPA:

Class Awarded	CGPA
First Class with Distinction	≥ 7.75
First Class	6.75≤ CGPA < 7.75
Second Class	6.00≤ CGPA < 6.75

A student with final CGPA (at the end of the **PGP) < 6.00** shall not be eligible for the Award of Degree.

11.0 Withholding of Results

If the student has not paid the dues, if any, to the University or if any case of indiscipline is pending against him, the result and degree of the student will be withheld and he will not be allowed into the next semester.

12.0. Transitory Regulations

12.1 A student who has been detained in any semester of I Year of R13/R15 Regulations due to lack of attendance, shall be permitted to join the same semester of I Year of R17 Regulations and he is required to complete the study of M.Pharm programme within the stipulated period of four academic years from the date of first admission in I Year I semester. The R17 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester.

12.2 Candidate detained due to shortage of attendance in one or more subjects is eligible for re-registration of maximum of two earlier or equivalent subjects at a time as and when offered.

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12.3 The candidate who fails in any subject under R13/R15 regulations will be given two chances to pass the same subject in the same regulations; otherwise, he has to identify an equivalent subject and fulfill the academic requirements of that subject as per R17 Academic Regulations.

12.4 For student readmitted to R17 Regulations, the maximum credits that a student acquires for the award of the degree, shall be the sum of the total number of credits secured in R13/R15 regulations of his/her study including R17 Regulations.

12.5 If a student readmitted to R17 Regulations, has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R17 regulations will be substituted by another subject to be suggested by the university.

13.0 General

13.1 **Credit**: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.

13.2 **Credit Point:** It is the product of grade point and number of credits for a course.

13.3 Wherever the words "he", "him", "his", occur in the regulations, they shall include "she", "her".

13.4 The academic regulation should be read as a whole for the purpose of any interpretation.

13.5 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the University is final.

13.6 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

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MALPRACTICESRULES
DISCIPLINARYACTIONFOR / IMPROPERCONDUCTINEXAMINATIONS

S.No	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject to the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. Incase of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject to the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of

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		semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent/ any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in- charge, or any person on duty in or outside the examination hall or any	Incase of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

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	of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any par there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.

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10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses1to11shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractices)
   - (i) A show cause notice shall be issued to the college.
   - (ii) Impose a suitable fine on the college.
   - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

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Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

Grams: "TECHNOLOGY"
E Mail: dapjntuh@gmail.com

Phone: Off: +91-40-23156115
Fax: +91-40-23158665

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

(Established by Andhra Pradesh Act No.30 of 2008)

Kukatpally, Hyderabad – 500 085, Andhra Pradesh (India)

REVISED ACADEMIC REGULATIONS R15 FOR B. PHARM. (REGULAR)

Applicable for the students of B. Pharm. (Regular) from the Academic Year 2015-16 and onwards.

1. **Award of B. Pharm. Degree**

A student will be declared eligible for award of the B. Pharm. Degree if he fulfils the following academic regulations:

1.1 The candidate shall pursue a course of study for not less than four academic years and not more than eight academic years.

1.2 After eight academic years of course work, the candidate is permitted to write the examinations for two more years.

1.3 The candidate shall register for all the prescribed [1]**226 (224+2 (Gender Sensitization Course))** credits and secure all the 226 credits.

2. The students, who fail to fulfil all the academic requirements for the award of the degree within ten academic years from the year of their admission, shall forfeit their seats in B. Pharm. course.

3. **Credits**

	I Year		Semester	
	Periods / Week	**Credits**	**Periods / Week**	**Credits**
Theory	03	06	04	04
	02	04	03	03
	04	08	-	-
Practicals	03	04	03	02
	02	02	-	-
Seminar	--	--	--	02
Project & Viva	--	--	--	04

4. **Distribution and Weightage of Marks**

4.1 The performance of a student in each semester or I year shall be evaluated subject-wise for a maximum of 100 marks for a theory and 75 marks for a practical subject. In addition, Seminar and Project Work shall be evaluated for 50 and 100 marks, respectively.

4.2 For theory subjects the distribution shall be 25 marks for Internal Evaluation and 75 marks for the End-Examination.

4.3 For theory subjects, during a semester there shall be 2 mid-term examinations. Each mid-term examination consists of one objective paper, one essay paper and one assignment. The objective paper and essay paper shall be for 10 marks each with a total duration of 1 hour 20 minutes (20 minutes for objective and 60 minutes for essay paper). The Objective paper is set with 20 bits of multiple choice, fill-in the blanks and matching type of questions for a total of 10 marks.
The essay paper shall contain 4 full questions (one from each unit) out of which, the student has to answer 2 questions, each carrying 5 marks.
While the first mid-term examination shall be conducted on 1 to 2.5 units of the syllabus, the second mid-term examination shall be conducted on 2.5 to 5 units. 5 marks are allocated for Assignments as specified by the subject teacher concerned to the first Assignment should be submitted before the conduct of the first mid-examination, and the second Assignment should be submitted before the conduct of the second mid-examination. The total marks secured by the student in each mid-term examination are evaluated for 25 marks, and the average of the two mid-term examinations shall be taken as the final marks secured by each candidate.

[1] Univ. Procs No. A1/2557/XXII SCAS/2016 dated 18.01.2016

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However, in the I year, there shall be 3 mid term examinations (each for 25 marks), along with 3 assignments in a similar pattern as above (1st mid shall be from Unit-I, 2nd mid shall be 2 &3 Units and 3rd mid shall be 4 & 5 Units) and the average marks of the examinations secured (each evaluated for a total of 25 marks) in each subject shall be considered as final marks for the internals/sessionals. If any candidate is absent from any subject of a mid-term examination, an on-line test will be conducted for him by the university. The details of the Question Paper pattern is as follows:

- The End semesters Examination will be conducted for 75 marks which consists of two parts viz. i). Part-A for 25 marks, ii). Part –B for 50 marks.
- Part-A is compulsory question which consists of ten sub-questions. The first five sub-questions are from each unit and carries 2 marks each. The next five sub-questions are one from each unit and carries 3 marks each.
- Part-B consists of five Questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice (that means there will be two questions from each unit and the student should answer any one question)

4.4 For practical subjects there shall be a continuous evaluation during a semester for 25 sessional marks and 50 end semester examination marks. Out of the 25 marks for internal evaluation, day-to-day work in the laboratory shall be evaluated for 15 marks and internal examination for practical shall be evaluated for 10 marks conducted by the laboratory teacher concerned. The end semester examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the clusters of colleges which are decided by the examination branch of the University.

4.5 There shall be a seminar presentation in IV Year I Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding of the topic, and submit it to the department. It shall be evaluated by the Departmental Academic Committee consisting of Head of the Department, Seminar Supervisor and a Senior Faculty Member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for the seminar.

4.6 Out of a total of 100 marks for the project work, 25 marks shall be allotted for Internal Evaluation and 75 marks for the End Semester Examination (Viva Voce). The End Semester Examination shall be conducted by a committee consisting of an external examiner, head of the department, supervisor of the project and a senior faculty member of the department. Seminar and project work shall be on the same topic. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project.

4.7 The Laboratory marks and the sessional marks awarded by the College are subject to scrutiny and scaling by the University wherever necessary. In such cases, the sessional and laboratory marks awarded by the College will be referred to a Committee. The Committee will arrive at a scaling factor and the marks will be scaled as per the scaling factor. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective institutions as per the University norms and produced to the Committees of the University as and when required.

4.8 There shall be a Comprehensive Viva-Voce in IV year II semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of the Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is intended to assess the students' understanding of the subjects that he studied during the B. Pharm. course of study. The Comprehensive Viva-Voce is valued for 100 marks by the Committee. There are no internal marks for the Comprehensive Viva-Voce.

4.9 **[2]The 'Gender Sensitization' course in II Year II semester in B.Tech. and B. Pharmacy for all the branches in the Constituent and Affiliated Colleges of JNTUH including Autonomous Colleges as a compulsory subject in addition to the existing course structure of R 13 and R15 Regulations and it should be treated as a Lab subject (Student Centered) with two credits from the academic year 2015-16.**

4.10 **Internal assessment should be based on attendance requirement as per the norms of the University, Assignments (during the course) and a mini project (at the end of the course).**

4.11 **Since this is a value added course, the name of the course may be reflected in the Marks Memo. Final result would be Pass/Fail based on the marks obtained in the Internal Evaluation. Marks obtained in the course will not be included in the aggregate marks for the award of the degree. 40% marks should be obtained to get a pass grade**

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[2] Univ. Procds No. A1/2557/XXII SCAS/2015 (2) dated 19.11.2015

5. **Attendance**

5.1 A student is eligible to write the University examinations only if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
5.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or I year may be granted by the College Academic Committee.
5.3 Shortage of Attendance below 65% in aggregate shall not be condoned.
5.4 A student who is short of attendance in a semester / I year may seek re-admission into that semester/I year when offered within 4 weeks from the date of the commencement of class work.
5.5 Students whose shortage of attendance is not condoned in any semester/I year, are not eligible to write their end semester examinations of that class and their registration stands cancelled.
5.6 A stipulated fee shall be payable towards condonation of shortage of attendance.
5.7 A student will be promoted to the next semester if he satisfies the attendance requirement of the present semester/I year, as applicable, including the days of attendance in sports, games, NCC and NSS activities..
5.8 If any candidate fulfils the attendance requirement in the present semester or I year, he shall not be eligible for readmission into the same class.

6. **Minimum Academic Requirements**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no. 5.

6.1 A student is deemed to have satisfied the minimum academic requirements if he has earned **the** credits allotted to each theory/practical design/drawing subject/project and secures not less than 35% of marks in the end semester exam, and minimum 40% of marks in the sum total of the mid-term and end semester exams.
6.2 [3]**A student will not be promoted from I Year to II Year unless he fulfills the academic requirement of 28 credits out of 56 credits of I year from all the examinations and secures prescribed minimum attendance in I year.**
6.3 **A student shall be promoted from Second Year to Third year only if he fulfills the academic requirement of 50 credits (excluding 2 credits of Gender Sensitization Course) from one regular and one supplementary examinations of I year, and one regular and one supplementary examination of II year I semester irrespective of whether or not the candidate takes the examination, and secures prescribed minimum attendance in II Year II Semester.**
6.4 **A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of total 84 credits (excluding 2 credits of Gender Sensitization Course) from the following examinations, whether the candidate takes the examinations or not, and secures prescribed minimum attendance in III Year II Semester.**

a. Two regular and two supplementary examinations of I year.

b. Two regular and two supplementary examinations of II year I semester.

c. Two regular and one supplementary examinations of II year II semester.

d. One regular and one supplementation examination of III year I semester.

6.5 A student shall put up in the required minimum attendance in all classes and earn all the **226** credits. Marks obtained in all subjects registered for **224** credits shall be considered for the calculation of percentage of marks.
6.6 Students who fail to earn **226** credits as indicated in the course structure within ten academic years from the year of their admission shall forfeit their seats in B. Pharm. course and their admission stands cancelled.

7. **Course pattern**

7.1 The entire course of study is for four academic years. I year shall be on yearly pattern and II, III and IV years on semester pattern.
7.2 A student, eligible to appear for the end examination in a subject, but absent from it or has failed in the end semester examination, may write the exam in that subject during the period of supplementary exams**.**
7.3 **When a student is [4]detained in a semester/year due to shortage of attendance, he may be re-admitted when the same semester/year is offered for the next academic year for fulfillment of**

[3] Procds No. A1/2557/XXI SCAS/2015 (1) dated 09.10.2015
[4] Procds No. A1/2557/XXI SCAS/2015 (1) dated 09.10.2015

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Ghatkesar Mdl,Medchal Dist ,Telangana.

academic requirements. However, the academic regulations under which he was first admitted, shall continues to be applicable to him.

7.4 When a student is detained due to lack of credits, he may be promoted to the next academic year only after acquiring the required academic credits. However, the academic regulations under which he was first admitted, shall continues to be applicable to him.

8. **Award of Class**

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Pharm. Degree, he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured	
First Class with Distinction	70% and above	From the aggregate marks secured from 224 credits.
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

The marks obtained in internal evaluation and end semester /I year examinations shall be shown separately in the memorandum of marks.

9. **Minimum Instruction Days**

The minimum instruction days for each semester/I year shall be 90/180 days.

10. There shall be no branch transfers after the completion of the admission process.

11. **There shall be no transfer from one college/stream to another within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Hyderabad.**

12. **WITHHOLDING OF RESULTS**

If the student has not paid the dues, if any, to the university or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

13. **TRANSITORY REGULATIONS**

13.1 Discontinued, detained, or failed candidates are eligible for re-admission to two earlier or equivalent subjects at a time as and when offered.

13.2 The candidate who fails in any subject will be given two chances to pass the same subject; otherwise, he has to identify an equivalent subject as per R13 academic regulations.

13.3 After the revision of the regulations, the students of the previous batches will be given two chances for passing in their failed subjects, one supplementary and the other regular. If the students cannot clear the subjects in the given two chances, they shall be given equivalent subjects as per the revised regulations which they have to clear in order to obtain the required number of credits.

13.4 In case of transferred students from other Universities, the credits shall be transferred to JNTUH as per the academic regulations and course structure of the University.

14. **General**

14.1 Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

14.2 The academic regulations should be read as a whole for purpose of any interpretation.

14.3 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

14.4 The University may change or amend the academic regulations and syllabi at any time and the changes and amendments made shall be applicable to all the students of all classes with effect from the date notified by the University.

14.5 There shall be no transfers of students from one constituent college to another constituent college of Jawaharlal Nehru Technological University Hyderabad.

14.6 The students seeking transfer to colleges affiliated to JNTUH from various other Universities/Institutions have to pass the failed subjects which are equivalent to the subjects of JNTUH, and also pass the subjects of JNTUH which the candidates have not studied at the earlier Institution, on their own without the right to sessional marks. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of JNTUH, the candidates have to study those subjects in JNTUH in spite of the fact that those subjects are repeated.

PRINCIPAL
Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

Grams: "TECHNOLOGY"
E Mail: dapjntuh@gmail.com

Phone: Off: +91-40-23156115
Fax: +91-40-23158665

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

(Established by Andhra Pradesh Act No.30 of 2008)

Kukatpally, Hyderabad – 500 085, Andhra Pradesh (India)

REVISED ACADEMIC REGULATIONS R15 FOR B. PHARM (LATERAL ENTRY SCHEME)

Applicable for the students admitted into II year B. Pharm. (LES) from the Academic Year *2015-16* and onwards

1. Eligibility for award of B. Pharm. Degree (LES)

1.1 The LES candidates shall pursue a course of study for not less than 3 academic years and not more than six academic years.
1.2 They shall be permitted to write the examinations for two more years after six academic years of course work.
1.3 Register for all **170** credits and Secure all the **170** credits.

2. The students have to acquire **170** credits from II to IV year B. Pharm. program (LES) for the award of B. Pharm. degree.

3. The students, who fail to fulfil the requirement for the award of the degree in 8 consecutive academic years (6 years of study + 2 years additionally for appearing exams only) from the year of admission, shall forfeit their seat.

4. The attendance regulations of B. Pharm. (Regular) shall be applicable to B.Pharm (LES).

5. [5]**Promotion Rule**

5.1 A student shall be promoted from II Year to III year only if he fulfills the academic requirement of 17 credits (excluding 2 credits of Gender Sensitization Course) from one regular and one supplementary examinations of II year I semester irrespective of whether or not the candidate takes the examination, and secures prescribed minimum attendance in II Year II Semester.

5.2 A student shall be promoted from III year to IV year only if he fulfils the academic requirements of 50 credits (excluding 2 credits of Gender Sensitization Course) from the following examinations, whether the candidate takes the examinations or not, and secures prescribed minimum attendance in III Year II Semester.

a. Two regular and two supplementary examinations of II year I semester.
b. Two regular and one supplementary examinations of II year II semester.
c. One regular and one supplementation examination of III year I semester.

6. **Award of Class**

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Pharm. Degree, he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured	
First Class with Distinction	70% and above	From the aggregate marks secured from 168 Credits from II year to IV year.
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

The marks obtained in the internal evaluation and the end semester examination shall be shown separately in the marks memorandum.

7. All the other regulations as applicable to B. Pharm.4-year degree course (Regular) will hold good for B. Pharm. Lateral Entry Scheme.

[5] Procds No. A1/2557/XXI SCAS/2015 (1) dated 09.10.2015

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MALPRACTICES RULES COMMON FOR ALL

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

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	charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
   - (i) A show cause notice shall be issued to the college.
   - (ii) Impose a suitable fine on the college.
   - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

(Established by an Act No.30 of 2008 of A.P. State Legislature)

Kukatpally, Hyderabad – 500 085, Andhra Pradesh (India)

R 15 - ACADEMIC REGULATIONS (CBCS) FOR M. Pharm. (REGULAR) DEGREE PROGRAMMES

Applicable for the students of M. Pharm. (Regular) programme from the Academic Year ***2015-16*** and onwards

The M. Pharm. Degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on candidates who are admitted to the programme and who fulfill all the requirements for the award of the Degree.

1.0 ELIGIBILITY FOR ADMISSIONS

Admission to the above programme shall be made subject to eligibility, qualification and specialization as prescribed by the University from time to time.

Admissions shall be made on the basis of merit/rank obtained by the candidates at the qualifying Entrance Test conducted by the University or on the basis of any other order of merit as approved by the University, subject to reservations as laid down by the Govt. from time to time.

2.0 AWARD OF M. Pharm. DEGREE

2.1 A student shall be declared eligible for the award of the M. Pharm. Degree, if he pursues a course of study in not less than two and not more than four academic years. However, he is permitted to write the examinations for two more years after four academic years of course work, failing which he shall forfeit his seat in M. Pharm. programme.

2.2 The student shall register for all 88 credits and secure all the 88 credits.

2.3 The minimum instruction days in each semester are 90.

3.0 COURSES OF STUDY

The following specializations are offered at present for the M. Pharm. programme of study.

1. Industrial Pharmacy
2. Hospital and Clinical Pharmacy
3. Pharmaceutics
4. Pharmaceutical Chemistry
5. Pharmaceutical Technology
6. Pharmacognosy
7. Pharmacology
8. Pharmaceutical Analysis and Quality Assurance

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9. Pharmaceutical Management & Regulatory Affaires
10. Quality Assurance
11. Quality Assurance & Pharma Regulatory Affairs,

4 Course Registration

4.1 A 'Faculty Advisor or Counselor' shall be assigned to each student, who will advise him on the Post Graduate Programme (PGP), its Course Structure and Curriculum, Choice/Option for Subjects/ Courses, based on his competence, progress, pre-requisites and interest.

4.2 Academic Section of the College invites 'Registration Forms' from students with in 15 days from the commencement of classwork through 'ON-LINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ON-LINE Registration Requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

4.3 A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his Faculty Advisor, which should be submitted to the College Academic Section through the Head of Department (a copy of it being retained with Head of Department, Faculty Advisor and the Student).

4.4 If the Student submits ambiguous choices or multiple options or erroneous entries - during ON-LINE Registration for the Subject(s) / Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, only the first mentioned Subject/ Course in that Category will be taken into consideration.

4.5 Subject/ Course Options exercised through ON-LINE Registration are final and CANNOT be changed, nor can they be inter-changed; further, alternate choices will also not be considered. However, if the Subject/ Course that has already been listed for Registration (by the Head of Department) in a Semester could not be offered due to any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

5 ATTENDANCE

The programmes are offered on a unit basis with each subject being considered a unit.

5.1 Attendance in all classes (Lectures/Laboratories etc.) is compulsory. The minimum required attendance in each theory / Laboratory etc. is 75% including the days of attendance in sports, games, NCC and NSS activities for appearing for the End Semester examination. A student shall not be permitted to appear for the Semester End Examinations (SEE) if his attendance is less than 75%.

5.2 Condonation of shortage of attendance in each subject up to 10% (65% and above and below 75%) in each semester shall be granted by the College Academic Committee.

5.3 Shortage of Attendance below 65% in each subject shall not be condoned.

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5.4 Students whose shortage of attendance is not condoned in any subject are not eligible to write their end semester examination of that subject and their registration shall stand cancelled.

5.5 A prescribed fee shall be payable towards condonation of shortage of attendance.

5.6 A Candidate shall put in a minimum required attendance at least three (3) theory subjects in I Year I semester for promoting to I Year II Semester. In order to qualify for the award of the M. Pharm. Degree, the candidate shall complete all the academic requirements of the subjects, as per the course structure.

5.7 A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present Semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

6 EVALUATION

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for theory and 100 marks for practicals, on the basis of Internal Evaluation and End Semester Examination.

6.1 For the theory subjects 75 marks shall be awarded for the performance in the Semester End Examination and 25 marks shall be awarded for Continuous Internal Evaluation (CIE). The Continuous Internal Evaluation shall be made based on the average of the marks secured in the two Mid Term-Examinations conducted, one in the middle of the Semester and the other, immediately after the completion of Semester instructions. Each mid-term examination shall be conducted for a total duration of 120 minutes with Part A as compulsory question (10 marks) consisting of 5 sub-questions carrying 2 marks each, and Part B with 3 questions to be answered out of 5 questions, each question carrying 5 marks. The details of the Question Paper pattern for End Examination (Theory) are given below:

- The Semester End Examination will be conducted for 75 marks. It consists of two parts. i).Part-A for 25 marks, ii). Part-B for 50 marks.
- Part-A is a compulsory question consisting of 5 questions, one from each unit and carries 5 marks each.
- Part-B to be answered 5 questions carrying 10 marks each. There will be two questions from each unit and only one should be answered.

6.2 For practical subjects, 75 marks shall be awarded for performance in the Semester End Examinations and 25 marks shall be awarded for day-to-day performance as Internal Marks.

6.3 For conducting laboratory end examinations of all PG Programmes, one internal examiner and one external examiner are to be appointed by the Principal of the College and the same to be informed to the Director of Evaluation in two weeks before for commencement of the lab end examinations. The external examiner should be selected from outside the College concerned but within the cluster. No

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external examiner should be appointed from any other College in the same cluster/any other cluster which is run by the same Management.

6.4 There shall be two seminar presentations during I year I semester and II semester. For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Departmental Academic Committee consisting of Head of the Department, Supervisor and two other senior faculty members of the department. For each Seminar there will be only internal evaluation of 50 marks. A candidate has to secure a minimum of 50% of marks to be declared successful. If he fails to fulfill minimum marks, he has to reappear during the supplementary examinations.

6.5 There shall be a Comprehensive Viva-Voce in II year I Semester. The Comprehensive Viva-Voce is intended to assess the students' understanding of various subjects he has studied during the M. Tech. course of study. The Head of the Department shall be associated with the conduct of the Comprehensive Viva-Voce through a Committee. The Committee consisting of Head of the Department, one senior faculty member and an external examiner. The external examiner shall be appointed by the Director of Evaluation. For this, the Principal of the College shall submit a panel of 3 examiners. There are no internal marks for the Comprehensive Viva-Voce and evaluates for maximum of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful. If he fails to fulfill minimum marks, he has to reappear during the supplementary examinations.

6.6 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the Semester End Examination and a minimum aggregate of 50% of the total marks in the Semester End Examination and Continuous Internal Evaluation taken together.

6.7 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 6.6) he has to reappear for the Semester End Examination in that subject.

6.8 A candidate shall be given one chance to re-register for the subjects if the internal marks secured by a candidate is less than 50% and failed in that subject for maximum of two subjects and should register within four weeks of commencement of the class work. In such a case, the candidate must re-register for the subjects and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the Semester End Examination in those subjects. In the event of the student taking another chance, his Continuous Internal Evaluation (internal) marks and Semester End Examination marks obtained in the previous attempt stands cancelled.

6.9 In case the candidate secures less than the required attendance in any subject, he shall not be permitted to write the Semester End Examination in that subject. He shall re-register for the subject when next offered.

7 Examinations and Assessment - The Grading System

7.1 Marks will be awarded to indicate the performance of each student in each Theory Subject, or Lab/Practicals, or Seminar, or Project, etc., based on the % marks obtained

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in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 6 above, and a corresponding Letter Grade shall be given.

7.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured (Class Intervals)	*Letter Grade (UGC Guidelines)*	*Grade Points*
80% and above (ǂ 80% , ≤ 100%)	O (Outstanding)	10
Below 80% but not less than 70% (ǂ 70% , < 80%)	A^+ (Excellent)	9
Below 70% but not less than 60% (ǂ 60% , < 70%)	A (Very Good)	8
Below 60% but not less than 55% (ǂ 55% , < 60%)	B^+ (Good)	7
Below 55% but not less than 50% (ǂ 50% , < 55%)	B (above Average)	6
Below 50% (< 50%)	F (FAIL)	0
Absent	**Ab**	**0**

7.3 A student obtaining F Grade in any Subject shall be considered 'failed' and is be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when offered. In such cases, his Internal Marks (CIE Marks) in those Subjects will remain the same as those he obtained earlier.

7.4 A student not appeared for examination then 'Ab' Grade will be allocated in any Subject shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when offered.

7.5 A Letter Grade does not imply any specific Marks percentage and it will be the range of marks percentage.

7.6 In general, a student shall not be permitted to repeat any Subject/ Course (s) only for the sake of 'Grade Improvement' or 'SGPA/ CGPA Improvement'.

7.7 A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course. The corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ Course.

Credit Points (CP) = Grade Point (GP) x Credits …. For a Course

7.8 The Student passes the Subject/ Course only when he **gets GP ǂ 6 (B Grade or above).**

7.9 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (SCP) secured from ALL Subjects/ Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

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SGPA = $\{ \sum_{i=1}^{N} C_i G_i \} / \{ \sum_{i=1}^{N} C_i \}$ .... For each Semester,

where 'i' is the Subject indicator index (takes into account all Subjects in a Semester), 'N' is the no. of Subjects 'REGISTERED' for the Semester (as specifically required and listed under the Course Structure of the parent Department), C_i is the no. of Credits allotted to the i^{th} Subject, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that i^{th} Subject.

7.10 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all Semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the I Year Second Semester onwards, at the end of each Semester, as per the formula

CGPA = $\{ \sum_{j=1}^{M} C_j G_j \} / \{ \sum_{j=1}^{M} C_j \}$ ... for all S Semesters registered (ie., upto and inclusive of S Semesters, S ǂ 2),

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' from the 1^{st} Semester onwards upto and inclusive of the Semester S (obviously M > N), 'j' is the Subject indicator index (takes into account all Subjects from 1 to S Semesters), C_j is the no. of Credits allotted to the j^{th} Subject, and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that j^{th} Subject. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

7.11 For Calculations listed in Item 7.6 – 7.10, performance in failed Subjects/ Courses (securing F Grade) will also be taken into account, and the Credits of such Subjects/ Courses will also be included in the multiplications and summations.

8. EVALUATION OF PROJECT/DISSERTATION WORK

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

8.1 A Project Review Committee (PRC) shall be constituted with Head of the Department as Chairperson, Project Supervisor and one senior faculty member of the Departments offering the M. Pharm. programme.

8.2 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects, both theory and practical.

8.3 After satisfying 8.2, a candidate has to submit, in consultation with his Project Supervisor, the title, objective and plan of action of his project work to the PRC for approval. Only after obtaining the approval of the PRC the student can initiate the Project work.

8.4 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the PRC. However, the PRC shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of cha

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Supervisor or topic as the case may be.

8.5 A candidate shall submit his project status report in two stages at least with a gap of 3 months between them.

8.6 The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of all theory and practical courses with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. For the approval of PRC the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.

8.7 After approval from the PRC, the soft copy of the thesis should be submitted to the University for ANTI-PLAGIARISM for the quality check and the plagiarism report should be included in the final thesis. If the copied information is less than 24%, then only thesis will be accepted for submission.

8.8 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College/School/Institute.

8.9 For Project work Review I in II Year I Sem. there is an internal marks of 50, the evaluation should be done by the PRC for 25 marks and Supervisor will evaluate for 25 marks. The Supervisor and PRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain. A candidate has to secure a minimum of 50% of marks to be declared successful for Project Work Review I. If he fails to fulfill minimum marks, he has to reappear during the supplementary examination.

8.10 For Project work Review II in II Year II Sem. there is an internal marks of 50, the evaluation should be done by the PRC for 25 marks and Supervisor will evaluate for 25 marks. The PRC will examine the overall progress of the Project Work and decide the Project is eligible for final submission or not. A candidate has to secure a minimum of 50% of marks to be declared successful for Project Work Review II. If he fails to fulfill minimum marks, he has to reappear during the supplementary examination.

8.11 For Project Evaluation (Viva Voce) in II Year II Sem. there is an external marks of 150 and the same evaluated by the External examiner appointed by the University. The candidate has to secure minimum of 50% marks in Project Evaluation (Viva-Voce) examination.

8.12 If he fails to fulfill as specified in 8.11, he will reappear for the Viva-Voce examination only after three months. In the reappeared examination also, fails to fulfill, he will not be eligible for the award of the degree.

8.13 The thesis shall be adjudicated by one examiner selected by the University. For this, the Principal of the College shall submit a panel of 3 examiners, eminent in that field, with the help of the guide concerned and Head of the Department.

8.14 If the report of the examiner is not favourable, the candidate shall revise and resubmit the Thesis. If the report of the examiner is unfavourable again, the thesis shall be summarily rejected.

8.15 If the report of the examiner is favourable, Project Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department

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external examiner who adjudicated the Thesis.

8.16 The Head of the Department shall coordinate and make arrangements for the conduct of Project Viva- Voce examination.

9. AWARD OF DEGREE AND CLASS

9.1 A Student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG Programme (PGP), and secures the required number of **88** Credits (with CGPA ‡ 6.0), shall be declared to have 'QUALIFIED' for the award of the M. Pharm. Degree in the chosen Branch of Engineering and Technology with specialization as he admitted.

9.2 **Award of Class**

After a student has satisfied the requirements prescribed for the completion of the programme and is eligible for the award of M. Pharm. Degree, he shall be placed in one of the following three classes based on the CGPA:

Class Awarded	CGPA
First Class with Distinction	≥ 7.75
First Class	6.75 ≤ CGPA < 7.75
Second Class	6.00 ≤ CGPA < 6.75

9.3 A student with final CGPA (at the end of the PGP) < 6.00 will not be eligible for the Award of Degree.

10. WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the University or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

11. TRANSITORY REGULATIONS

11.1 If any candidate is detained due to shortage of attendance in one or more subjects, they are eligible for re-registration to maximum of two earlier or equivalent subjects at a time as and when offered.

11.2 The candidate who fails in any subject will be given two chances to pass the same subject; otherwise, he has to identify an equivalent subject as per R15 Academic Regulations.

12 GENERAL

12.1 **Credit**: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.

12.2 **Credit Point:** It is the product of grade point and number of credits for a course.

12.3 Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her".

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12.4 The academic regulation should be read as a whole for the purpose of any interpretation.

12.5 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

12.6 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

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MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in- charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

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	or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractices)
   - (i) A show cause notice shall be issued to the college.
   - (ii) Impose a suitable fine on the college.
   - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

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Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

Grams: "TECHNOLOGY"
E Mail: dapjntuh@gmail.com

Phone: Off: +91–40–23156115
Fax: +91–40–23158665

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

(Established by Andhra Pradesh Act No.30 of 2008)

Kukatpally, Hyderabad – 500 085, Andhra Pradesh (India)

ACADEMIC REGULATIONS R13 FOR B. PHARM. (REGULAR)

Applicable for the students of B. Pharm. (Regular) from the Academic Year 2013-14and onwards.

1. **Award of B. Pharm. Degree**

A student will be declared eligible for award of the B. Pharm. Degree if he fulfils the following academic regulations:

1.1 The candidate shall pursue a course of study for not less than four academic years and not more than eight academic years.

1.2 After eight academic years of course work, the candidate is permitted to write the examinations for two more years.

1.3 The candidate shall register for all the prescribed 224 credits and secure all the 224 credits.

2. The students, who fail to fulfil all the academic requirements for the award of the degree within ten academic years from the year of their admission, shall forfeit their seats in B. Pharm. course.

3. **Credits**

	I Year		Semester	
	Periods / Week	**Credits**	**Periods / Week**	**Credits**
Theory	03	06	04	04
	02	04	03	03
	04	08	-	-
Practicals	03	04	03	02
	02	02	-	-
Seminar	--	--	--	02
Project & Viva	--	--	--	04

4. **Distribution and Weightage of Marks**

4.1 The performance of a student in each semester or I year shall be evaluated subject-wise for a maximum of 100 marks for a theory and 75 marks for a practical subject. In addition, Seminar and Project Work shall be evaluated for 50 and 100 marks, respectively.

4.2 For theory subjects the distribution shall be 25 marks for Internal Evaluation and 75 marks for the End-Examination.

4.3 For theory subjects, during a semester there shall be 2 mid-term examinations. Each mid-term examination consists of one objective paper, one essay paper and one assignment. The objective paper and essay paper shall be for 10 marks each with a total duration of 1 hour 20 minutes (20 minutes for objective and 60 minutes for essay paper). The Objective paper is set with 20 bits of multiple choice, fill-in the blanks and matching type of questions for a total of 10 marks.
The essay paper shall contain 4 full questions (one from each unit) out of which, the student has to answer 2 questions, each carrying 5 marks.
While the first mid-term examination shall be conducted on 1 to 2.5 units of the syllabus, the second mid-term examination shall be conducted on 2.5 to 5 units. 5 marks are allocated for Assignments as specified by the subject teacher concerned to the first Assignment should be submitted before the conduct of the first mid-examination, and the second Assignment should be submitted before the conduct of the second mid-examination. The total marks secured by the student in each mid-term examination are evaluated for 25 marks, and the average of the two mid-term examinations shall be taken as the final marks secured by each candidate.
However, in the I year, there shall be 3 mid term examinations (each for 25 marks), along with 3 assignments in a similar pattern as above (1st mid shall be from Unit-I, 2nd mid shall be 2 &3 Units and 3rd mid shall be 4 & 5 Units) and the average marks of the examinations secured (each evaluated for a total of 25 marks) in each subject shall be considered as final marks for the internals/sessionals. If any candidate is absent from any subject of a mid-term examination, an on-line test will

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for him by the university. ***The details of the Question Paper pattern without deviating from the R13 regulations as notified in the website is as follows:***

- ***The End semesters Examination will be conducted for 75 marks which consists of two parts viz. i). Part-A for 25 marks, ii). Part –B for 50 marks.***
- ***Part-A is compulsory question which consists of ten sub-questions. The first five sub-questions are from each unit and carries 2 marks each. The next five sub-questions are one from each unit and carries 3 marks each.***
- ***Part-B consists of five Questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice (that means there will be two questions from each unit and the student should answer any one question)***

4.4 For practical subjects there shall be a continuous evaluation during a semester for 25 sessional marks and 50 end semester examination marks. Out of the 25 marks for internal evaluation, day-to-day work in the laboratory shall be evaluated for 15 marks and internal examination for practical shall be evaluated for 10 marks conducted by the laboratory teacher concerned. The end semester examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the clusters of colleges which are decided by the examination branch of the University.

4.5 There shall be a seminar presentation in IV Year I Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding of the topic, and submit it to the department. It shall be evaluated by the Departmental Academic Committee consisting of Head of the Department, Seminar Supervisor and a Senior Faculty Member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for the seminar.

4.6 Out of a total of 100 marks for the project work, 25 marks shall be allotted for Internal Evaluation and 75 marks for the End Semester Examination (Viva Voce). The End Semester Examination shall be conducted by a committee consisting of an external examiner, head of the department, supervisor of the project and a senior faculty member of the department. Seminar and project work shall be on the same topic. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project.

4.7 The Laboratory marks and the sessional marks awarded by the College are subject to scrutiny and scaling by the University wherever necessary. In such cases, the sessional and laboratory marks awarded by the College will be referred to a Committee. The Committee will arrive at a scaling factor and the marks will be scaled as per the scaling factor. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective institutions as per the University norms and produced to the Committees of the University as and when required.

4.8 There shall be a Comprehensive Viva-Voce in IV year II semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of the Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is intended to assess the students' understanding of the subjects that he studied during the B. Pharm. course of study. The Comprehensive Viva-Voce is valued for 100 marks by the Committee. There are no internal marks for the Comprehensive Viva-Voce.

5. **<u>Attendance</u>**

5.1 A student is eligible to write the University examinations only if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
5.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or I year may be granted by the College Academic Committee.
5.3 Shortage of Attendance below 65% in aggregate shall not be condoned.
5.4 A student who is short of attendance in a semester / I year may seek re-admission into that semester/I year when offered within 4 weeks from the date of the commencement of class work.
5.5 Students whose shortage of attendance is not condoned in any semester/I year, are not eligible to write their end semester examinations of that class and their registration stands cancelled.
5.6 A stipulated fee shall be payable towards condonation of shortage of attendance.
5.7 A student will be promoted to the next semester if he satisfies the attendance requirement of the present semester/I year, as applicable, including the days of attendance in sports, games, NCC and NSS activities..
5.8 If any candidate fulfils the attendance requirement in the present semester or I year, he shall not be eligible for readmission into the same class.

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6. **Minimum Academic Requirements**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no. 5.

6.1 A student is deemed to have satisfied the minimum academic requirements if he has earned **the** credits allotted to each theory/practical design/drawing subject/project and secures not less than 35% of marks in the end semester exam, and minimum 40% of marks in the sum total of the mid-term and end semester exams.

6.2 A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement.

6.3 A student shall not be promoted from II year to III year unless he fulfils the academic requirement of 34 credits up to II year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.
A student shall be promoted from III year to IV year only if he fulfils the academic requirement of 56 credits up to III year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.

6.4 A student shall put up in the required minimum attendance in all classes and earn all the 224 credits. Marks obtained in all subjects registered for 224 credits shall be considered for the calculation of percentage of marks.

6.5 Students who fail to earn 224 credits as indicated in the course structure within ten academic years from the year of their admission shall forfeit their seats in B. Pharm. course and their admission stands cancelled.

7. **Course pattern**

7.1 The entire course of study is for four academic years. I year shall be on yearly pattern and II, III and IV years on semester pattern.

7.2 A student eligible to appear for the end examination in a subject, but absent from it or has failed in the end semester examination, may write the exam in that subject during the period of supplementary exams.

7.3 When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into the next semester/year. However, the academic regulations under which he was first admitted, shall continue to be applicable to him.

8. **Award of Class**

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Pharm. Degree, he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured	
First Class with Distinction	70% and above	**From the aggregate marks secured from 224 credits.**
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

The marks obtained in internal evaluation and end semester /I year examinations shall be shown separately in the memorandum of marks.

9. **Minimum Instruction Days**

The minimum instruction days for each semester/I year shall be 90/180 days.

10. There shall be no branch transfers after the completion of the admission process.

11. **There shall be no transfer from one college/stream to another within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Hyderabad.**

12. **WITHHOLDING OF RESULTS**

If the student has not paid the dues, if any, to the university or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

13. **TRANSITORY REGULATIONS**

13.1 Discontinued, detained, or failed candidates are eligible for re-admission to two earlier or equivalent subjects at a time as and when offered.

13.2 The candidate who fails in any subject will be given two chances to pass the same s

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he has to identify an equivalent subject as per R13 academic regulations.

13.3 After the revision of the regulations, the students of the previous batches will be given two chances for passing in their failed subjects, one supplementary and the other regular. If the students cannot clear the subjects in the given two chances, they shall be given equivalent subjects as per the revised regulations which they have to clear in order to obtain the required number of credits.

13.4 In case of transferred students from other Universities, the credits shall be transferred to JNTUH as per the academic regulations and course structure of the University.

14. **General**

14.1 Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

14.2 The academic regulations should be read as a whole for purpose of any interpretation.

14.3 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

14.4 The University may change or amend the academic regulations and syllabi at any time and the changes and amendments made shall be applicable to all the students of all classes with effect from the date notified by the University.

14.5 There shall be no transfers of students from one constituent college to another constituent college of Jawaharlal Nehru Technological University Hyderabad.

14.6 The students seeking transfer to colleges affiliated to JNTUH from various other Universities/Institutions have to pass the failed subjects which are equivalent to the subjects of JNTUH, and also pass the subjects of JNTUH which the candidates have not studied at the earlier Institution, on their own without the right to sessional marks. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of JNTUH, the candidates have to study those subjects in JNTUH in spite of the fact that those subjects are repeated.

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Princeton College of Pharmacy,
Korremula Vill, Vijayapuri Colony,
Ghatkesar Mdl,Medchal Dist ,Telangana.

Grams: "TECHNOLOGY"
E Mail: dapjntuh@gmail.com

Phone: Off: +91–40–23156115
Fax: +91–40–23158665

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

(Established by Andhra Pradesh Act No.30 of 2008)

Kukatpally, Hyderabad – 500 085, Andhra Pradesh (India)

ACADEMIC REGULATIONS R13 FOR B. PHARM (LATERAL ENTRY SCHEME)

Applicable for the students admitted into II year B. Pharm. (LES) from the Academic Year 2013-14and onwards

1. **Eligibility for award of B. Pharm. Degree (LES)**

   1.1 The LES candidates shall pursue a course of study for not less than 3 academic years and not more than six academic years.
   1.2 They shall be permitted to write the examinations for two more years after six academic years of course work.
   1.3 Register for all 168 credits and Secure all the 168 credits.

2. The students have to acquire 168 credits from II to IV year B. Pharm. program (LES) for the award of B. Pharm. degree.

3. The students, who fail to fulfil the requirement for the award of the degree in 8 consecutive academic years (6 years of study + 2 years additionally for appearing exams only) from the year of admission, shall forfeit their seat.

4. The attendance regulations of B. Pharm. (Regular) shall be applicable to B.Pharm (LES).

5. **Promotion Rule**

   A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement

   A student shall be promoted from III year to IV year only if he fulfils the academic requirements of **34 credits up to III year I semester from all the examinations, whether or not the candidate takes the examinations.**

6. **Award of Class**

   After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Pharm. Degree, he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured	From the aggregate marks secured from 168 Credits from II year to IV year.
First Class with Distinction	70% and above	
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

   The marks obtained in the internal evaluation and the end semester examination shall be shown separately in the marks memorandum.

7. All the other regulations as applicable to B. Pharm.4-year degree course (Regular) will hold good for B. Pharm. Lateral Entry Scheme.

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MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

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Ghatkesar Mdl,Medchal Dist ,Telangana.

	charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
   - (i) A show cause notice shall be issued to the college.
   - (ii) Impose a suitable fine on the college.
   - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

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